

Historic, Archive Document

**Do not assume content reflects current
scientific knowledge, policies, or practices.**

43

UNITED STATES
DEPARTMENT OF AGRICULTURE
LIBRARY



BOOK NUMBER

69

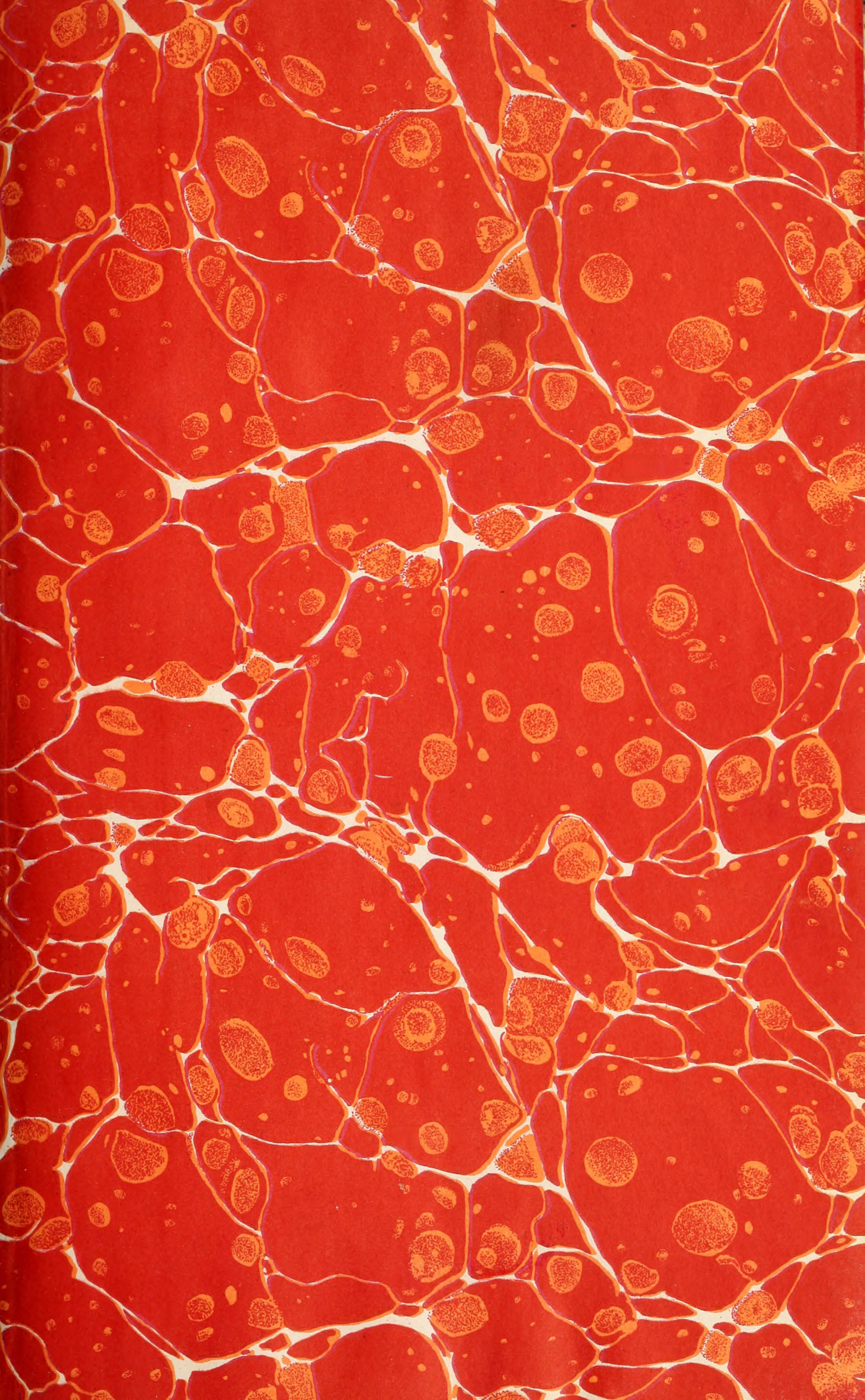
1

Ex6R

July-Dec.
1933

GPO 8-7671

256037



UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS

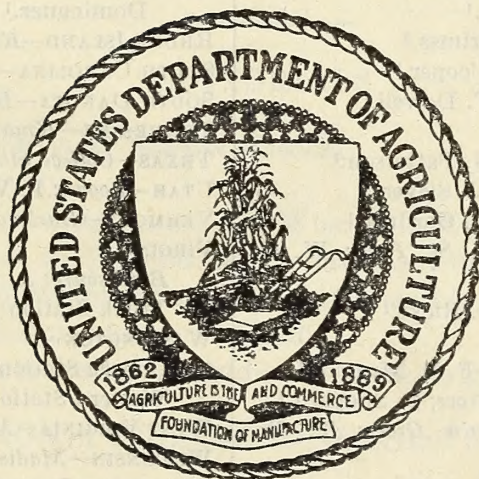
9615-4
agw

EXPERIMENT STATION RECORD

10
242

VOLUME 69

JULY-DECEMBER 1933



Library, U. S. Department of Agriculture,
Washington, D. C.

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1934

U.S. DEPARTMENT OF AGRICULTURE

SECRETARY—Henry A. Wallace

UNDER SECRETARY—Rexford G. Tugwell

OFFICE OF EXPERIMENT STATIONS—James T. Jardine, *Chief*

THE AGRICULTURAL EXPERIMENT STATIONS

ALABAMA— <i>Auburn</i> : M. J. Funchess. ¹	NEVADA— <i>Reno</i> : S. B. Doten. ¹
ALASKA— <i>College</i> : G. W. Gasser. ¹	NEW HAMPSHIRE— <i>Durham</i> : J. C. Kendall. ¹
ARIZONA— <i>Tucson</i> : P. S. Burgess. ¹	NEW JERSEY— <i>New Brunswick</i> : W. H. Martin. ²
ARKANSAS— <i>Fayetteville</i> : C. O. Brannen. ²	NEW MEXICO— <i>State College</i> : Fabian Garcia. ¹
CALIFORNIA— <i>Berkeley</i> : C. B. Hutchison. ¹	NEW YORK—
COLORADO— <i>Fort Collins</i> : E. P. Sandsten. ¹	State Station: <i>Geneva</i> ; U. P. Hedrick. ¹
CONNECTICUT—	Cornell Station: <i>Ithaca</i> ; C. E. Ladd. ¹
[New Haven] Station: <i>New Haven</i> ; } W. L. Slate. ¹	NORTH CAROLINA— <i>State College Station, Raleigh</i>
Storrs Station: <i>Storrs</i> ; }	R. Y. Winters. ¹
DELAWARE— <i>Newark</i> : C. A. McCue. ¹	NORTH DAKOTA— <i>State College Station, Fargo</i> ; H. L.
FLORIDA— <i>Gainesville</i> : W. Newell. ¹	Walster. ¹
GEORGIA—	OHIO— <i>Wooster</i> : C. G. Williams. ¹
Experiment: H. P. Stuckey. ¹	OKLAHOMA— <i>Stillwater</i> : C. P. Blackwell. ¹
Coastal Plain Station: <i>Tifton</i> : S. H. Starr. ¹	OREGON— <i>Corvallis</i> : W. A. Schoenfeld. ¹
HAWAII— <i>Honolulu</i> : J. M. Westgate. ¹	PENNSYLVANIA— <i>State College</i> : R. L. Watts. ¹
IDAHO— <i>Moscow</i> : E. J. Iddings. ¹	PUERTO RICO—
ILLINOIS— <i>Urbana</i> : H. W. Mumford. ¹	Federal Station: <i>Mayaguez</i> ; H. A. Lee. ¹
INDIANA— <i>La Fayette</i> : J. H. Skinner. ¹	Insular Station: <i>Rio Piedras</i> ; F. A. Lopez
IOWA— <i>Ames</i> : R. E. Buchanan. ¹	Dominguez. ¹
KANSAS— <i>Manhattan</i> : W. E. Grimes. ²	RHODE ISLAND— <i>Kingston</i> : G. E. Adams. ¹
KENTUCKY— <i>Lexington</i> : T. P. Cooper. ¹	SOUTH CAROLINA— <i>Clemson College</i> : H. W. Barre. ¹
LOUISIANA— <i>Baton Rouge</i> : C. T. Dowell. ¹	SOUTH DAKOTA— <i>Brookings</i> : J. W. Wilson. ¹
MAINE— <i>Orono</i> : F. Griffie. ¹	TENNESSEE— <i>Knoxville</i> : C. A. Mooers. ¹
MARYLAND— <i>College Park</i> : H. J. Patterson. ¹	TEXAS— <i>College Station</i> : A. B. Conner. ¹
MASSACHUSETTS— <i>Amherst</i> : F. J. Sievers. ¹	UTAH— <i>Logan</i> : P. V. Cardon. ¹
MICHIGAN— <i>East Lansing</i> : V. R. Gardner. ¹	VERMONT— <i>Burlington</i> : J. L. Hills. ¹
MINNESOTA— <i>University Farm, St. Paul</i> : W. C.	VIRGINIA—
Coffey. ¹	<i>Blacksburg</i> : A. W. Drinkard, Jr. ¹
MISSISSIPPI— <i>State College</i> : J. R. Ricks. ¹	Truck Station: <i>Norfolk</i> ; H. H. Zimmerley. ¹
MISSOURI—	WASHINGTON—
College Station: <i>Columbia</i> ; F. B. Mumford. ¹	College Station: <i>Pullman</i> ; E. C. Johnson. ¹
Fruit Station: <i>Mountain Grove</i> ; P. Shepard. ¹	Western Station: <i>Puyallup</i> ; J. W. Kalkus. ³
Poultry Station: <i>Mountain Grove</i> ; T. W.	WEST VIRGINIA— <i>Morgantown</i> : F. D. Fromme. ¹
Noland. ¹	WISCONSIN— <i>Madison</i> : C. L. Christensen. ¹
MONTANA— <i>Bozeman</i> : F. B. Linfield. ¹	WYOMING— <i>Laramie</i> : J. A. Hill. ¹
NEBRASKA— <i>Lincoln</i> : W. W. Burr. ¹	

¹ Director.

² Acting director.

³ Superintendent.

EXPERIMENT STATION RECORD

Editor: HOWARD LAWTON KNIGHT

EDITORIAL DEPARTMENTS

Agricultural and Biological Chemistry—H. C. WATERMAN, SYBIL L. SMITH.
 Agricultural Meteorology—W. H. BEAL.
 Soils and Fertilizers—H. C. WATERMAN.
 Agricultural Botany, Diseases of Plants—J. W. WELLINGTON, H. M. STEECE,
 F. V. RAND.
 Genetics—H. M. STEECE, J. W. WELLINGTON, G. HAINES.
 Field Crops—H. M. STEECE.
 Horticulture and Forestry—J. W. WELLINGTON.
 Economic Zoology and Entomology, Veterinary Medicine—W. A. HOOKER.
 Animal Husbandry, Dairying, and Dairy Farming—H. W. MARSTON.
 Agricultural Engineering—R. W. TRULLINGER.
 Agricultural Economics—F. G. HARDEN, B. YOUNGBLOOD.
 Rural Sociology—B. YOUNGBLOOD, F. G. HARDEN.
 Agricultural and Home Economics Education—F. G. HARDEN.
 Foods and Human Nutrition—SYBIL L. SMITH.
 Textiles and Clothing—H. M. STEECE, SYBIL L. SMITH.
 Home Management and Equipment— ————
 Indexes—MARTHA C. GUNDLACH.
 Bibliographies—CORAL L. FELDKAMP.

CONTENTS OF VOLUME 69

EDITORIALS

	Page
General indexes to <i>Experiment Station Record</i>	1
The <i>Record</i> now a monthly.....	2
Fiftieth anniversary of the Alabama and Wisconsin Experiment Stations.....	161
Appropriations available to the Federal Department of Agriculture.....	321
A handbook of the agricultural experiment stations in temperate countries.....	481
The agricultural experiment stations in 1932.....	625
Samuel Fortier, a pioneer leader in studies of farm irrigation practice.....	769

STATION PUBLICATIONS ABSTRACTED

ALASKA STATIONS:

Report, 1931-1932..... 36, 47, 88, 157

ARIZONA STATION:

Bulletin 142.....	65
Bulletin 143.....	701
Bulletin 144.....	720
Technical Bulletin 45.....	155
Technical Bulletin 46.....	42
Technical Bulletin 47.....	379

ARKANSAS STATION :

	Page
Bulletin 283	674
Bulletin 284	760
Bulletin 285	745
Bulletin 286	758
Bulletin 287	874
Bulletin 288	781
Bulletin 289	780

CALIFORNIA STATION :

Bulletin 544	292
Bulletin 545	52
Bulletin 546	85
Bulletin 547	294
Bulletin 548	87
Bulletin 549	59
Bulletin 550	255
Bulletin 551	772
Bulletin 552	635
Circular 328	55

Hilgardia, volume 7 :

No. 8, January 1933	554
No. 9, April 1933	520
No. 10, April 1933	542
No. 11, April 1933	555
No. 12, June 1933	826

California Committee on the Relation of Electricity to Agriculture :

Progress Report 19	6
Progress Report 20	51

An Economic Survey of the Incomes, Expenses, and Taxpaying Abilities of Farmers on Lands in the Merced Irrigation District, California, M. R. Benedict	293
--	-----

Economic and Legal Aspects of Compulsory Proration in Agricultural Marketing, E. A. Stokdyk	741
---	-----

The California Muscat Grape Outlook, G. M. Peterson and S. W. Shear	883
---	-----

Income and Expenses on the Larger Properties in the Merced Irrigation District during the Years 1926, 1927, and 1928, M. R. Benedict	881
--	-----

Annual Report, 1932	3, 16, 37, 47, 59, 60, 71, 88, 97, 104, 116, 143, 157
---------------------	---

COLORADO STATION :

Bulletin 398	135
Bulletin 399	397
Bulletin 400	835
Technical Bulletin 1	29
Technical Bulletin 2	328
Technical Bulletin 3	871
Technical Bulletin 4	839

CONNECTICUT STATE STATION :

Bulletin 344	231
Bulletin 345	318
Bulletin 346	234
Bulletin 347 (Report, 1932)	178, 207, 209, 217, 221, 231, 317

CONNECTICUT STATE STATION—Continued.

Page

Bulletin 348	399
Bulletin 349	546
Bulletin 350	518, 550
Bulletin 351	698
Bulletin 352	771
Fifty-fifth Report, 1931	157

CONNECTICUT STORRS STATION:

Bulletin 180	607
Bulletin 181 (Report, 1932)	511, 572, 621
Bulletin 182	888
Bulletin 183	795
Special Bulletin, The Drawing and Handling of Blood Samples for the Serological Diagnosis of Bang's Abortion Disease	107
Forty-first Annual Report, 1929	157
Forty-second Annual Report, 1930	157
Forty-third Annual Report, 1931	909

DELAWARE STATION:

Bulletin 179 (Annual Report, 1932)	3, 16, 37, 48, 60, 71, 88, 98, 126, 157
Bulletin 180	365
Bulletin 181	81
Bulletin 182	889
Bulletin 183	846

FLORIDA STATION:

Bulletin 254	50
Bulletin 255	257
Bulletin 256	223
Bulletin 257	524
Annual Report, 1932	178, 188, 199, 209, 221, 231, 248, 257, 265, 281, 298, 303, 317

GEORGIA STATION:

Bulletin 173	464
Bulletin 174	605
Bulletin 175	668
Forty-fifth Annual Report, 1932	199, 209, 217, 221, 248, 295, 308, 317

GEORGIA COASTAL PLAIN STATION:

Bulletin 19 (Twelfth Annual Report, 1931)	16, 37, 48, 60, 157
---	---------------------

HAWAII STATION:

Bulletin 65	793
Bulletin 66	778, 806
Circular 6	524
Report, 1932	633, 635, 643, 652, 683, 697, 747, 766

IDAHO STATION:

Bulletin 194	253
Bulletin 195	293
Bulletin 196	214
Bulletin 197 (Annual Report, 1932)	776, 788, 798, 810, 824, 838, 848, 865, 871, 898, 909
Research Bulletin 11	828
Circular 62	131
Circular 69	318

IDAHO STATION—Continued.

Circular 70	285
Circular 71	795

ILLINOIS STATION :

Bulletin 388	94
Bulletin 389	417
Bulletin 390	881
Bulletin 391	840
Bulletin 392	887
Bulletin 401	105
Bulletin 402	132
Bulletin 403	115
Bulletin 404	52
Bulletin 405	51
Bulletin 406	747
Bulletin 407	765
Bulletin 408	766
Soil Reports 54-55	778

INDIANA STATION :

Bulletin 363	125
Bulletin 364	136
Bulletin 365	130
Bulletin 366	49
Bulletin 367	125
Bulletin 368	371
Bulletin 369	888
Bulletin 370	885
Bulletin 371	841
Bulletin 372	849
Bulletin 373	849
Bulletin 374	853
Bulletin 375	854
Bulletin 376	885
Bulletin 377	857
Bulletin 378	881
Circular 193	138
Circular 194	104
Circular 195	841
Circular 196	781
Circular 197	776, 789, 798, 831, 909
Forty-fifth Annual Report, 1932	3,
	16, 37, 48, 57, 60, 71, 89, 98, 104, 116, 126, 143, 150, 156, 157

IOWA STATION :

Bulletin 297	597
Bulletin 298	515
Bulletin 299	565
Bulletin 300	574
Bulletin 301	507
Research Bulletin 154	100
Research Bulletin 155	103
Research Bulletin 156	134
Research Bulletin 157	498
Research Bulletin 158	505

IOWA STATION—Continued.		Page
Research Bulletin 159	-----	575
Research Bulletin 160	-----	738
Circular 138	-----	408
Circulars 139-144	-----	131
Circulars 145-148	-----	603
Leaflet 30	-----	93
Variations in Corn Prices within Iowa, T. W. Schultz	-----	740
Annual Report, 1932	-----	3,
	16, 27, 37, 48, 58, 60, 71, 89, 98, 104, 116, 126, 143, 148, 158	
KANSAS STATION:		
Bulletin 261	-----	407
Bulletin 262	-----	201
Bulletin 263	-----	240
Bulletin 264	-----	701
Technical Bulletin 33	-----	597
Technical Bulletin 34	-----	570
Circular 169	-----	212
Circular 170	-----	514
Biennial Report, 1931-32	-----	179,
	189, 193, 195, 199, 209, 221, 232, 248, 257, 265, 281, 287, 304, 308, 317	
KENTUCKY STATION:		
Bulletin 325	-----	24
Bulletin 333	-----	111
Bulletin 333, Supplement	-----	433
Bulletin 334	-----	45
Bulletin 335	-----	571
Bulletin 337	-----	704
LOUISIANA STATION:		
Bulletin 231, part 2	-----	886
Bulletin 233	-----	128
Bulletin 234	-----	141
Bulletin 235	-----	80
Bulletin 236	-----	408
Bulletin 237	-----	648
MAINE STATION:		
Bulletin 363 (Report, 1932)	----- 353, 364, 372, 385, 394, 410, 437, 444, 462, 477	
Official Inspections 146	-----	519, 520
MARYLAND STATION:		
Bulletin 337	-----	129
Bulletin 338	-----	129
Bulletin 339	-----	446
Bulletin 340	-----	411
Bulletin 341	-----	613
Bulletin 342	-----	572
Bulletin 343	-----	520
Bulletin 344	-----	574
Forty-fifth Annual Report, 1932	----- 643, 652, 663, 681, 686, 736, 766	
MASSACHUSETTS STATION:		
Bulletin 289	-----	96
Bulletin 290	-----	23
Bulletin 291	-----	99

MASSACHUSETTS STATION—Continued.

	Page
Bulletin 292	220
Bulletin 293 (Annual Report, 1932)	633,
634, 641, 643, 652, 663, 682, 686, 687, 705, 709, 712, 734, 736, 747, 766	
Bulletin 294	291
Bulletin 295	862
Control Series Bulletin 66	25
Control Series Bulletin 67	363
Meteorological Bulletins 529-530, January-February 1933	177
Meteorological Bulletins 531-532, March-April 1933	332

MICHIGAN STATION :

Special Bulletin 228	216
Special Bulletin 228, Supplement	217
Special Bulletin 229	302
Special Bulletin 230	212
Special Bulletin 231	778
Special Bulletin 232	743
Special Bulletin 233	700
Special Bulletin 234	648
Special Bulletin 235	741
Special Bulletin 236	744
Technical Bulletin 128	51
Technical Bulletin 129	22
Technical Bulletin 130	53
Technical Bulletin 131	457
Technical Bulletin 132	328
Technical Bulletin 133	746
Quarterly Bulletin, volume 15:	
No. 3, February 1933	3, 5,
23, 55, 56, 59, 68, 76, 83, 97, 101, 102, 103, 123, 125, 130, 152, 158	
No. 4, May 1933	488, 489, 494, 495, 513, 520, 522, 525, 526, 532, 550, 553,
559, 561, 567, 568, 572, 573, 574, 581, 597, 600, 621	

MINNESOTA STATION :

Bulletin 290	123
Bulletin 291	201
Bulletin 292	201
Bulletin 293	135
Bulletin 294	431
Bulletin 296	462
Bulletin 297	659
Technical Bulletin 86	93
Technical Bulletin 87	346
Technical Bulletin 88	527
Technical Bulletin 89	529
Technical Bulletin 90	544
Fortieth Annual Report, 1932	167, 211, 222, 246, 256, 258, 318

MISSISSIPPI STATION :

Technical Bulletin 20	514
-----------------------	-----

MISSOURI STATION :

Bulletin 319	55
Bulletin 320	79
Bulletin 321	187

MISSOURI STATION—Continued.

	Page
Bulletin 322-----	202
Bulletin 323-----	601
Bulletin 324-----	779
Bulletin 325-----	699
Research Bulletin 177-----	118
Research Bulletin 178-----	152
Research Bulletin 179-----	94
Research Bulletin 180-----	407
Research Bulletin 181-----	420
Research Bulletin 182-----	349
Research Bulletin 183-----	552
Research Bulletin 184-----	528
Research Bulletin 185-----	576
Research Bulletin 186-----	564
Research Bulletin 187-----	574
Circular 169-----	78

MISSOURI FRUIT STATION:

Circular 23-----	654
Circular 24-----	654
Circular 26-----	654
Biennial Report, 1931-32-----	621

MONTANA STATION:

Bulletin 268-----	247
Bulletin 269-----	232
Bulletin 270-----	46
Bulletin 271-----	477
Bulletin 272-----	606
Bulletin 273-----	778
Bulletin 274-----	778
Bulletin 275-----	842
Bulletin 276-----	898
Bulletin 277-----	899
Circulars 140-142-----	425

NEBRASKA STATION:

Bulletin 276-----	91
Bulletin 277-----	596
Bulletin 278-----	521
Bulletin 279-----	789
Bulletin 280-----	847
Research Bulletin 64-----	156
Research Bulletin 65-----	28
Research Bulletin 66-----	531
The University of Nebraska Tax Primer, G. O. Virtue-----	136
Forty-sixth Annual Report [1932]-----	484,
	495, 512, 520, 526, 547, 562, 572, 578, 596, 621

NEVADA STATION:

Bulletin 130-----	612
Annual Report, 1932-----	93, 158

NEW HAMPSHIRE STATION:

Bulletin 268-----	90
Bulletin 269-----	504

NEW HAMPSHIRE STATION—Continued.

	Page
Bulletin 270 (Annual Report, 1932)_____	348,
	353, 364, 373, 385, 406, 417, 420, 441, 445, 477
Bulletin 271_____	502
Circular 40_____	569
Scientific Contribution 37_____	638
Scientific Contribution 38_____	670
Scientific Contribution 39_____	651

NEW JERSEY STATIONS:

Bulletin 550_____	363
Bulletin 551_____	24
Bulletin 552_____	451
Bulletin 553_____	682
Circular 264_____	242
Circular 265_____	246
Circular 266_____	24
Circular 267_____	287
Circular 268_____	255
Circular 269_____	207
Circular 270_____	213
Circular 271_____	368
Circular 272_____	383
Circular 273_____	383
Circular 274_____	368
Circular 275_____	377
Circular 276_____	599
Circular 277_____	408
Circulars 278-280_____	373
Circular 281_____	523
Circulars 282-284_____	373
Circular 285_____	705
Circular 286_____	803
Circular 287_____	804
Circular 288_____	807
Circular 289_____	807

NEW MEXICO STATION:

Bulletin 207_____	362
Bulletin 208_____	705
Bulletin 209_____	799
Forty-third Annual Report, 1932_	180, 193, 200, 210, 222, 232, 249, 282, 303, 318

NEW YORK CORNELL STATION:

Bulletin 545_____	504
Bulletin 546_____	137
Bulletin 547_____	140
Bulletin 548_____	202
Bulletin 549_____	134
Bulletin 550_____	53
Bulletin 551_____	454
Bulletin 552_____	51
Bulletin 553_____	360
Memoir 142_____	296

NEW YORK CORNELL STATION—Continued.

	Page
Memoir 143.....	224
Memoir 144.....	295
Memoir 145.....	366
Memoir 146.....	337
Forty-fifth Annual Report, 1932.....	16,
	25, 35, 36, 38, 40, 50, 52, 57, 60, 72, 89, 99, 116, 127, 158

NEW YORK STATE STATION :

Bulletin 618.....	210
Bulletin 619.....	211
Bulletin 620.....	367
Bulletin 621.....	376
Bulletin 622.....	343
Bulletin 623.....	367
Bulletin 624.....	377
Bulletin 625.....	369
Bulletin 626.....	715
Bulletin 627.....	691
Bulletin 628.....	707
Technical Bulletin 206.....	394
Technical Bulletin 207.....	416
Technical Bulletin 208.....	367
Technical Bulletin 209.....	347

NORTH CAROLINA STATION :

Bulletin 280.....	128
Bulletin 281.....	43
Bulletin 282.....	94
Bulletin 283.....	205
Bulletin 284.....	455
Bulletin 285.....	341
Bulletin 286.....	843
Bulletin 287.....	859
Bulletin 288.....	882
Agronomy Information Circular 74.....	437
Agronomy Information Circular 75.....	56
Agronomy Information Circular 76.....	442
Agronomy Information Circular 77.....	179
Agronomy Information Circular 78.....	203
Agronomy Information Circular 79.....	187

NORTH DAKOTA STATION :

Bulletin 263.....	568
Bulletin 264.....	203
Bulletin 265.....	580
Bulletin 266.....	364
Bulletin 267.....	369
Circular 46.....	207

OHIO STATION :

Bulletin 515.....	101
Bulletin 516 (Fifty-first Annual Report, 1932).....	13,
	17, 38, 48, 57, 61, 72, 90, 99, 104, 116, 127, 139, 143, 152, 156, 158
Bulletin 517.....	21
Bulletin 518.....	102
Bulletin 519.....	213

OHIO STATION—Continued.

	Page
Bulletin 520_____	220
Bulletin 521_____	455
Bulletin 522_____	374
Bulletin 523_____	742
Bulletin 524_____	693
Bulletin 525_____	807
Bimonthly Bulletin [161], volume 18, no. 2, March-April, 1933_____	39,
	45, 58, 78, 97, 99, 115, 128
Bimonthly Bulletin 162_____	513, 570, 574, 600, 616
Bimonthly Bulletin 163_____	794, 796, 810, 839, 874, 880
Special Circular 42_____	302
Forest News:	
No. 21, March 1933_____	217
No. 22, July 1933_____	810

OKLAHOMA STATION:

Bulletin 207_____	121
Bulletin 208_____	292
Bulletin 209_____	356
Bulletin [210]_____	205
Bulletin 211_____	614
Current Farm Economics:	
Volume 6:	
No. 1, February 1933_____	288
No. 2, April 1933_____	288
No. 3, June 1933_____	737
Supplement, [1933], Oklahoma Farm Prices, L. S. Ellis_____	740

[OKLAHOMA] PANHANDLE STATION:

Panhandle Bulletin 47_____	45
Panhandle Bulletin 48_____	210
Panhandle Bulletin 49_____	514
Panhandle Bulletin 50_____	573
Panhandle Bulletin 51_____	790

OREGON STATION:

Bulletin 308_____	208
Bulletin 309_____	252
Circular 107_____	73
Circular Information 52_____	396
A Digest of Recent Accomplishments of the Agricultural Experiment Station in Oregon_____	477
The Harney Branch Experiment Station, Burns, Oregon_____	353, 437, 477
The Hood River Branch Experiment Station, Hood River, Oregon_____	353,
	364, 384, 477
John Jacob Astor Branch Experiment Station, Astoria, Oregon_____	339, 353, 477
The Medford Branch Experiment Station, Medford, Oregon_____	365
Research at the Pendleton Field Station_____	353, 477
Sherman Branch Experiment Station, Moro, Oregon_____	353, 477
The Southern Oregon Branch Experiment Station, Talent, Oregon---	353,
	364, 477
The Umatilla Branch Experiment Station, Hermiston, Oregon_____	353,
	412, 437, 477
Oregon State Livestock Branch Experiment Station, Union, Oregon:	
A Progress Report_____	353, 406, 477

PENNSYLVANIA STATION :		Page
Bulletin 283	-----	808
Bulletin 284	-----	440
Bulletin 285	-----	389
Bulletin 286	-----	614
Bulletin 287	-----	851
Bulletin 288	-----	842
Bulletin 289	-----	794
Bulletin 290	-----	802
PUERTO RICO STATION :		
Report, 1932	-----	3, 38, 49, 105, 158
PUERTO RICO DEPARTMENT OF AGRICULTURE AND COMMERCE STATION :		
Circular 100	-----	50
Circular 101	-----	67
Circular 102 (Spanish edition)	-----	646
Annual Report, 1929 (English edition)	-----	909
Annual Report, 1932 (Spanish edition)	-----	771, 790, 798, 810, 824, 849, 909
RHODE ISLAND STATION :		
Annual Feed Circular, 1932	-----	90
Annual Fertilizer Circular, 1932	-----	24
Forty-fifth Annual Report, [1932]	-----	178, 200, 210, 278, 288, 317, 318
SOUTH CAROLINA STATION :		
Bulletin 287	-----	140
Bulletin 288	-----	291
Bulletin 289	-----	254
Circular 48	-----	358
Circular 49	-----	854
Circular 50	-----	886
SOUTH DAKOTA STATION :		
Bulletin 273	-----	100
Bulletin 274	-----	301
Bulletin 275	-----	532
Circular 6	-----	286
Circular 7	-----	446
Circular 8	-----	131
Circular 9	-----	603
TENNESSEE STATION :		
Bulletin 147	-----	76
Bulletin 148	-----	647
TEXAS STATION :		
Bulletin 467	-----	90
Bulletin 468	-----	95
Bulletin 469	-----	43
Bulletin 470	-----	91
Bulletin 471	-----	252
Bulletin 472	-----	39
Bulletin 473	-----	100
Bulletin 474	-----	316
Bulletin 475	-----	836
Circular 67	-----	369, 384
Circular 68	-----	504, 528, 532, 536, 541, 621

UTAH STATION:

Bulletin 241	368
Bulletin 242	118
Bulletin 243	837
Circular 101	892

VERMONT STATION:

Bulletin 351	841
Bulletin 352	805
Bulletin 353	882
Bulletin 354	809

VIRGIN ISLANDS STATION:

Report, 1932	512, 520, 525, 572, 585, 621
--------------	------------------------------

VIRGINIA STATION:

Bulletin 288	884
Technical Bulletin 46	41
Technical Bulletin 47	829
Technical Bulletin 48	869
Technical Bulletin 49	818

VIRGINIA TRUCK STATION:

Bulletin 79	678
Bulletin 80	653

WASHINGTON STATION:

Bulletin 276	215
Bulletin 277	453
Bulletin 278	356
Bulletin 279	561
Bulletin 280	549
Bulletin 281	790
Bulletin 282	907
Bulletin 283	908
Bulletin 284	845
Bulletin 285	880

WEST VIRGINIA STATION:

Bulletin 255	706
Bulletin 256	848
Circular 61	215
Circular 62	212
Circular 63	648
Circular 64	659
Circular 65	886

WISCONSIN STATION:

Bulletin 424	533
Bulletin 425 (Annual Report, 1932)	771, 776, 791, 798, 810, 825, 839, 848, 865, 874, 881, 889, 890, 908, 909
Research Bulletin 114	613
Research Bulletin 114, Supplement	613
Research Bulletin 115	705

WYOMING STATION:

Bulletin 191	92
Bulletin 193	421
Bulletin 194	422
Bulletin 195	791
Bulletin 196	786

UNITED STATES DEPARTMENT OF AGRICULTURE
PUBLICATIONS ABSTRACTED

Technical Bulletin :

301. The Public Domain of Nevada and Factors Affecting Its Use,	Page
E. O. Wooton.....	601
338. Relation of Leaf Area and Position to Quality of Fruit and	
to Bud Differentiation in Apples, M. H. Haller and J. R.	
Magness.....	54
339. Some Results of Inbreeding Grade Guernsey and Grade Holstein-	
Friesian Cattle, T. E. Woodward and R. R. Graves.....	30
340. Distinctive Effects of the Deficiency of Certain Essential Ele-	
ments on the Growth of Tobacco Plants in Solution Cultures,	
J. E. McMurtrey, Jr.....	362
341. Effects of Certain Environmental Factors on Stripe Disease of	
Barley and the Control of the Disease by Seed Treatment,	
R. W. Leukel, J. G. Dickson, and A. G. Johnson.....	62
342. Causes of Brashness in Wood, A. Koehler.....	219
343. Specific Gravity and Related Properties of Softwood Lumber,	
E. C. Pack.....	218
344. Petrographic Methods for Soil Laboratories, W. H. Fry.....	15
345. Biology and Morphology of the Spindle Worm, or Elder Borer,	
J. C. Silver.....	389
346. The Effect of Concentration on the Toxicity of Chemicals to	
Living Organisms, E. Bateman.....	380
347. An Economic Study of Broomcorn Production, R. S. Washburn	
and J. H. Martin.....	293
348. Use of the Exponential Yield Curve in Fertilizer Experiments,	
W. J. Spillman.....	339
349. Analysis of the Advanced Registry Records of 611 Daughters of	
51 Ayrshire Sires, M. H. Fohrman and R. R. Graves.....	414
350. Effect of Lead Arsenate Insecticides on Orange Trees in Florida,	
R. L. Miller, I. P. Bassett, and W. W. Yothers.....	73
351. Life History of the Angoumois Grain Moth in Maryland, P. Sim-	
mons and G. W. Ellington.....	390
352. Sudan Grass as Hay, Silage, and Pasture for Dairy Cattle, J. R.	
Dawson, R. R. Graves, and A. G. Van Horn.....	413
353. Agricultural Investigations at the Huntley (Mont.) Field	
Station, 1927-30, D. Hansen, A. E. Seamans, and D. V.	
Kopland.....	789, 807, 839, 848, 881, 909
355. An Analysis of Log Production in the "Inland Empire" Region,	
M. Bradner, F. J. Klobucher, J. W. Girard, and S. V. Full-	
away, Jr.....	809
356. Yellow Poplar Characteristics, Growth, and Management, E. F.	
McCarthy.....	808
357. State Land-Settlement Problems and Policies in the United	
States, W. A. Hartman.....	737
358. Laboratory and Field Tests of Concrete Exposed to the Action	
of Sulphate Waters, D. G. Miller and P. W. Manson.....	725
359. Farmers' Response to Price in Hog Production and Marketing,	
O. V. Wells.....	739
360. Curly-Top Resistance in Sugar Beets and Tests of the Resistant	
Variety U.S. No. 1, E. Carsner.....	818

Technical Bulletin—Continued.

361. The Hessian Fly in the Pacific Northwest, L. P. Rockwood and M. M. Reeher.....	Page 692
362. Bacterial Wilt of Corn, F. V. Rand and L. C. Cash.....	669
363. The Parasites of the Sugarcane Borer in Argentina and Peru, and Their Introduction into the United States, H. A. Jaynes.....	692
364. The Composition and Distribution of Phosphate Rock, with Special Reference to the United States, K. D. Jacob, W. L. Hill, H. L. Marshall, and D. S. Reynolds.....	780
365. Biology of <i>Brachymeria fonscolombeii</i> (Dufour), a Hymenopterous Parasite of Blowfly Larvae, R. A. Roberts.....	837

Farmers' Bulletin:

1695. Preparing Apples for Market in Barrels and Baskets, R. R. Pailthorp and J. W. Park.....	55
1696. Deciduous-Fruit Improvement through Tree-Performance Records, A. D. Shamel and C. S. Pomeroy.....	53
1697. Using Soil-Binding Plants to Reclaim Gullies in the South, H. G. Meginnis.....	59
1698. Heating the Farm Home, A. H. Senner.....	157
1699. Growing Root Crops for Livestock, H. L. Westover, H. A. Schoth, and A. T. Semple.....	354
1700. Marketing Hay by Modern Methods, G. A. Collier.....	610
1701. Corncribs for the Corn Belt, M. A. R. Kelley.....	600
1702. Preparing Peaches for Market, J. W. Park.....	523

Statistical Bulletin:

39. Cold-Storage Holdings: Year Ended December 31, 1931, with Comparable Data for Earlier Years.....	612
--	-----

Circular:

252. Commercial Cabbage Culture, V. R. Boswell.....	51
253. Spoilage of Stone Fruits on the Market, C. Brooks.....	68
254. Greenhouse Heating, A. H. Senner.....	124
255. Observations on the Mexican Fruit Fly and Some Related Species in Cuernavaca, Mexico, in 1928 and 1929, M. McPhail and C. I. Bliss.....	82
256. Outlines of Cotton Culture in the San Joaquin Valley of California, J. W. Hubbard.....	204
257. The Dorsett, Fairfax, and Narcissa Strawberries, G. M. Darrow and G. F. Waldo.....	56
258. Farmer Opinions and Other Factors Influencing Cotton Production and Acreage Adjustments in the South, T. B. Manny.....	132
259. The Potomac Raspberry, G. M. Darrow and G. F. Waldo.....	56
260. Operation and Management of Milk Plants, C. E. Clement.....	138
261. The Farm Real Estate Situation, 1931-32, B. R. Stauber.....	133
262. Root Development of Cotton Plants in the San Joaquin Valley of California, J. W. Hubbard and F. W. Herbert.....	357
263. Downy Mildew of Tobacco, E. E. Clayton and J. G. Gaines.....	67
264. Mechanical Application of Fertilizers to Cotton in South Carolina, 1931, G. A. Cumings, A. L. Mehring, J. J. Skinner, and W. H. Sachs.....	359
265. Conserving Food Value, Flavor, and Attractiveness in Cooking Vegetables, R. Loughlin.....	462
266. The Citrus Insects of Tropical Asia, C. P. Clausen.....	550

Circular—Continued.

267. Budding and Grafting Trials with Cotton and Related Plants, R. E. Beckett.....	Page 645
268. Golden Cross Bantam Sweet Corn, G. M. Smith.....	653
269. A Pest of Cured Tobacco, <i>Ephestia elutella</i> Hubner, W. D. Reed, E. Livingstone, and A. W. Morrill, Jr.....	690

Leaflet:

86. Protect Hardwood Stands from Grazing, W. K. Williams.....	372
92. Preparing Wool for Market, W. M. Buck.....	156
93. Red-Clover Seed Production in the Intermountain States, E. A. Hollowell.....	40
94. Hints on Mountain-Lion Trapping, S. P. Young.....	381
95. How to Control Ragweed, the Principal Cause of Autumn Hay Fever, B. W. Gahn.....	651

Miscellaneous Publication:

154. Workers in Subjects Pertaining to Agriculture in State Agricultural Colleges and Experiment Stations, M. A. Agnew.....	142
155. Directory of Field Activities of the Bureau of Plant Quarantine, 1933.....	664
156. The Agricultural Outlook for 1933.....	133
157. Power and Machinery in Agriculture, W. M. Hurst and L. M. Church.....	727

Inventory:

107. Plant Material Introduced by the Division of Foreign Plant Introduction, Bureau of Plant Industry, April 1 to June 30, 1931.....	504
108. Plant Material Introduced by the Division of Foreign Plant Introduction, Bureau of Plant Industry, July 1 to September 30, 1931.....	504

Yearbook 1933.....	644, 645, 650, 651, 697, 705, 736, 738, 744, 766
--------------------	--

Crops and Markets:

Volume 10:

No. 2, February 1933.....	139
No. 3, March 1933.....	296
No. 4, April 1933.....	458
No. 5, May 1933.....	612
No. 6, June 1933.....	744

OFFICE OF EXPERIMENT STATIONS:

Report on the Agricultural Experiment Stations, 1932, J. T. Jardine, W. H. Beal, et al.....	766
---	-----

BUREAU OF AGRICULTURAL ECONOMICS:

Agricultural Economics Bibliography:

No. 40. Barter and Scrip in the United States: Selected References.....	139
No. 41. The Domestic Allotment Plans for the Relief of Agriculture: Selected References, compiled by L. O. Bercaw.....	133
No. 42. Measures Taken by Foreign Countries to Relieve Agricultural Indebtedness, compiled by A. M. Hannay, M. Coult, and L. Crans.....	446

BUREAU OF AGRICULTURAL ECONOMICS—Continued.

Agricultural Economics Bibliography—Continued.

No. 43. Part-Time Farming: A Brief List of Recent References, compiled by E. M. Colvin-----	Page 455
No. 44. Uses for Cotton: Selected References in the English Language, compiled by M. C. Benton-----	620
No. 45. State Measures for the Relief of Agricultural Indebtedness in the United States, 1932 and 1933, compiled by L. O. Bercaw, M. T. Olcott, and M. F. Carpenter-----	604
No. 46. Group and Chain Farming in the United States, January 1930–March 1933, with Some References to Group Farming in Foreign Countries, compiled by E. M. Colvin-----	603
Foreign Service 58, Foreign Government Legislation Affecting Wheat, G. P. Boals-----	133
Comparative Advantages of Jute and Cotton Baggings for American Cotton Bales, J. W. Wright and R. J. Cheatham-----	514
Farmers' Response to Price: A Selected Bibliography, compiled by O. V. Wells-----	739
Special Report on Revised Estimates of United States Cotton Acreage and Yield, 1866–1931-----	744
Spinning Tests of Selected Bales of Sea Island, America-Egyptian, and Egyptian-Sakellaridis Cotton, M. E. Campbell-----	906

BUREAU OF AGRICULTURAL ENGINEERING:

Power Alcohol, compiled by D. W. Graf-----	730
--	-----

BUREAU OF CHEMISTRY AND SOILS:

[Soil Survey Reports], Series 1928:

No. 25. Soil Survey of Hampden and Hampshire Counties, Massachusetts, W. J. Latimer and L. R. Smith-----	15
No. 26. Soil Survey of Ottawa County, Ohio, A. H. Paschall et al-----	15
No. 27. Soil Survey of the Basin Area, Wyoming, J. Thorp et al-----	179
No. 28. Soil Survey of Suffolk and Nassau Counties, New York, C. Lounsbury et al-----	333
No. 29. Soil Survey of the San Luis Obispo Area, California, E. J. Carpenter and R. E. Storie-----	333

[Soil Survey Reports], Series 1929:

No. 7. Soil Survey of Caroline County, Maryland, H. B. Winant and S. R. Bacon-----	15
No. 8. Soil Survey of Talbot County, Maryland, S. O. Perkins and M. Hershberger-----	15
No. 9. Soil Survey of Franklin County, Massachusetts, W. J. Latimer et al-----	179
No. 10. Soil Survey of the Gooding Area, Idaho, F. O. Youngs et al-----	776
No. 11. Soil Survey of the Oceanside Area, California, R. E. Storie and E. J. Carpenter-----	776
No. 12. Soil Survey of Hart County, Georgia, G. L. Fuller-----	776
No. 13. Soil Survey of Worth County, Georgia, R. Wildermuth et al-----	776

[Soil Survey Reports], Series 1930:

No. 1. Soil Survey of the Fort Sumner Area, New Mexico, A. T. Sweet and E. N. Poulson-----	334
--	-----

BUREAU OF CHEMISTRY AND SOILS—Continued.

[Soil Survey Reports], Series 1930—Continued.

No. 2. Soil Survey of Calhoun County, Iowa, W. E. Tharp et al.....	Page 334
No. 3. Soil Survey of Kent County, Maryland, H. B. Winant and J. P. Bewley.....	334
No. 4. Soil Survey of Hancock County, Mississippi, C. Lounsbury et al.....	777
No. 5. Soil Survey of the Rincon Area, New Mexico, A. T. Sweet and E. N. Poulson.....	777
Review of U.S. Patents Relating to Pest Control, volume 5, Nos. 1-3, January-March, 1932.....	73

BUREAU OF ENTOMOLOGY:

The Effect of Various Commercial Calcium Arsenates on Bean Foliage, N. F. Howard and F. W. Fletcher.....	683
The Rearing of Blowflies and the Culture of Sterile Maggots for Use in Osteomyelitis, W. Robinson.....	83
The Use of Blowfly Maggots in the Treatment of Osteomyelitis and Certain Other Diseases, W. Robinson.....	83

FOREST SERVICE:

Forest Taxation Inquiry Progress Report 18, Changes in the Tax System Relating Especially to Forests: Conclusions and Recommendations	448
---	-----

BUREAU OF PLANT INDUSTRY:

Plant Disease Reporter:

Volume 16:

No. 3, March 15, 1932.....	536
No. 7, May 15, 1932.....	528

Volume 17:

No. 1, January 15, 1933.....	670, 677
No. 2, March 1, 1933.....	669
No. 4, May 1, 1933.....	670
No. 7, June 15, 1933.....	681
Supplement 84, March 15, 1933.....	663
Supplement 85, June 15, 1933.....	663

BUREAU OF PUBLIC ROADS:

Public Roads, volume 14:

No. 1, March 1933.....	284
No. 2, April 1933.....	284
No. 3, May 1933.....	722
No. 4, June 1933.....	722

WEATHER BUREAU:

Monthly Weather Review:

Volume 60:

No. 11, November 1932.....	176, 177, 178
No. 12, December 1932.....	176, 177

Volume 61:

No. 1, January 1933.....	332
No. 2, February 1933.....	332, 333
No. 3, March 1933.....	776
No. 4, April 1933.....	775, 776

WEATHER BUREAU—Continued.

Climatological Data :

Volume 19:	Page
Nos. 11-12, November-December 1932-----	177
No. 13, 1932-----	634
Volume 20:	
Nos. 1-2, January-February 1933-----	776
Daily River Stages, volume 29, 1931-----	282
Report, 1932-----	332

JOURNAL OF AGRICULTURAL RESEARCH

Volume 46:

No. 1, January 1, 1933-----	4, 12, 26, 30, 64, 86, 96
No. 2, January 15, 1933-----	19, 27, 40, 68, 74, 85, 113
No. 3, February 1, 1933-----	190, 207, 223, 224, 226, 251, 252, 270
No. 4, February 15, 1933-----	346, 354, 395, 398, 411, 427, 470
No. 5, March 1, 1933-----	347, 363, 366, 368, 374, 375, 388, 463
No. 6, March 15, 1933-----	342, 354, 370, 391, 413, 432
No. 7, April 1, 1933-----	512, 519, 525, 531, 557, 559, 563
No. 8, April 15, 1933-----	646, 676, 679, 696, 698, 722
No. 9, May 1, 1933-----	667, 669, 671, 672, 686, 689, 757
No. 10, May 15, 1933-----	649, 650, 665, 675, 698, 700
No. 11, June 1, 1933-----	779, 786, 813, 833, 843, 902

UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS

Vol. 69

JULY 1933

No. 1

EXPERIMENT STATION RECORD



By direction of the Secretary of Agriculture, the matter contained herein
is published as administrative information required for the
proper transaction of the public business

For sale by the Superintendent of Documents, Washington, D.C. Price 15 cents
Subscription per volume (2 volumes a year) consisting of 6 monthly numbers and index, \$1.00
Foreign subscription per volume, \$1.50

EXPERIMENT STATION RECORD

Editor: HOWARD LAWTON KNIGHT

EDITORIAL DEPARTMENTS

Agricultural and Biological Chemistry—H. C. WATERMAN, SYBIL L. SMITH.
Agricultural Meteorology—W. H. BEAL.
Soils and Fertilizers—H. C. WATERMAN.
Agricultural Botany, Diseases of Plants—W. E. BOYD, J. W. WELLINGTON,
H. M. STEECE.
Genetics—H. M. STEECE, J. W. WELLINGTON, G. HAINES.
Field Crops—H. M. STEECE.
Horticulture and Forestry—J. W. WELLINGTON.
Economic Zoology and Entomology, Veterinary Medicine—W. A. HOOKER.
Animal Husbandry, Dairying, and Dairy Farming—H. W. MARSTON.
Agricultural Engineering—R. W. TRULLINGER.
Agricultural Economics—F. G. HARDEN, B. YOUNGBLOOD.
Rural Sociology—B. YOUNGBLOOD, F. G. HARDEN.
Agricultural and Home Economics Education—F. G. HARDEN.
Foods and Human Nutrition—SYBIL L. SMITH.
Textiles and Clothing—H. M. STEECE, SYBIL L. SMITH.
Home Management and Equipment—
Indexes—MARTHA C. GUNDLACH.
Bibliographies—CORA L. FELDKAMP.

CONTENTS OF VOL. 69, NO. 1

Editorial:	Page
General indexes to <i>Experiment Station Record</i>	1
The <i>Record</i> now a monthly.....	2
Recent work in agricultural science.....	3
Agricultural and biological chemistry.....	3
Agricultural meteorology.....	13
Soils—fertilizers.....	14
Agricultural botany.....	25
Genetics.....	28
Field crops.....	36
Horticulture.....	47
Forestry.....	57
Diseases of plants.....	60
Economic zoology—entomology.....	70
Animal production.....	88
Dairy farming—dairying.....	97
Veterinary medicine.....	104
Agricultural engineering.....	116
Agricultural economics.....	126
Rural sociology.....	139
Agricultural and home economics education.....	141
Foods—human nutrition.....	142
Textiles and clothing.....	156
Home management and equipment.....	156
Miscellaneous.....	157
Notes.....	159

EXPERIMENT STATION RECORD

VOL. 69

JULY 1933

No. 1

EDITORIAL

GENERAL INDEXES TO EXPERIMENT STATION RECORD

The recent publication of the fifth general index to *Experiment Station Record* makes available in convenient form subject-matter references to all material printed in these columns before July 1929. In accordance with the policy of recent years, this index includes 10 volumes of the *Record*, covering volumes 51-60 and the 5-year period 1924-29. Since the current issue of the *Record* commences volume 69, no further general index is scheduled for issue for some time, although its preparation by consolidation of the separate volume indexes thus far completed has been begun, and in this form it is already available for consultation in Washington.

The general index for volumes 51-60 follows closely along the lines of its predecessors, as it is realized that continuity of policy and treatment is wellnigh indispensable. Some economies have been effected but without serious loss, it is hoped, of practical efficiency. Entries derived from experiment station and Department publications are again specifically indicated.

The total number of pages in the new index is 682 as compared with 709 with the index immediately preceding. The subject entries aggregate well over 50,000, and to many of these, of course, a number of references are made. These figures are only approximate, but they indicate how extensive are the ramifications of agricultural science under present conditions, as well as the virtual impossibility of keeping abreast of its developments without the aid of abstract journals and similar bibliographical aids.

Largely because of the high cost of publication of a general index, the edition is much smaller than that for the monthly issues of the *Record*, and it is therefore impracticable to attempt a distribution to the regular mailing list. The needs of libraries are being met, however, and it is thought that the supply will permit of a reasonably complete institutional distribution as well. Individuals and others not eligible for inclusion in the free distribution should find no difficulty in purchasing it through the Superintendent of

Documents, Government Printing Office, Washington, D.C. The price set by that official is 60 c. per copy.

Similar conditions have prevailed on previous general indexes, but some variations exist as to the reserve stock of those indexes which are still available. The edition of the first general index, covering volumes 1-12, was completely exhausted some time ago even as to the sales quota. Fortunately the original plates have been preserved, and steps have recently been taken to reprint a small number of copies in the immediate future. When available this reprint should enable libraries to complete their files in this respect without cost, as well as to provide by purchase for the needs of the many individuals who have had difficulty in obtaining this index in the past.

Of the subsequent general indexes, that for volumes 13-25 may still be purchased from the Superintendent of Documents at \$1 per copy. The indexes for volumes 26-40 and 41-50 are sold at 75 c. and \$1.25 per copy, respectively, but they are also still available for institutional use in the free distribution. Within the limits of the supply, the needs of teaching and research departments and similar groups will be met on direct application to the Office of Experiment Stations, U.S. Department of Agriculture.

THE RECORD NOW A MONTHLY

Communications still being received in considerable volume as to alleged nonreceipt of certain issues of the *Record* indicate continued misunderstanding as to the frequency of publication. As explained at the time of the change (E.S.R., 67, p. 193), beginning in September 1932 all so-called "abstract numbers" were eliminated. Six monthly issues with index, therefore, complete a volume, instead of nine numbers and index as formerly.

The enlargement of the individual numbers from exactly 100 to an average of 150 pages each has proved economical and on the whole advantageous. However, since the numbers no longer contain precisely 100 pages, locating citations to previous work is, as was foreseen, somewhat less convenient. Recently this difficulty has been lessened to some extent by printing on the binding edge of each number not only the title and date but the pages which the number includes. This should facilitate reference to the several issues pending binding, following which stage the matter becomes of less importance.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations of the California Station] (*California Sta. Rpt. 1932*, pp. 28, 29).—Data are included on the prevention of olive spoilage and on decrease of oil content on pickling, on the intensification of corrosion in grape juice by sulfurous acid, and on the resistance to corrosion by orange juice of stainless steels.

[Chemical investigations of the Iowa Station], C. H. WERKMAN ET AL. (*Iowa Sta. Rpt. 1932*, pp. 31, 32, 48, 49).—Notes are given on the work on fermentation products of xylan; fermentation products of levulose, produced by *Aerobacillus*; adaptation and development of the method of partition between solvents for the determination of fermentation products; nature of the floridin activation of cholesterol; and the identification of the water-soluble and the acid hydrolyzable carbohydrate constituents (hemicelluloses) of the cornstalk.

[Chemical studies of wheat flour and oil] (*Indiana Sta. Rpt. 1932*, p. 57).—Data are reported on the keeping quality of soft wheat flour as measured by the bacterial content and on the iodine number of wheat oil as a test of rancidity.

Report of the assistant chemist, J. O. CARRERO (*Puerto Rico Sta. Rpt. 1932*, pp. 8–11).—The report of the previous year (*E.S.R.*, 67, p. 500) is continued with notes on the chemical composition of sugarcane variety P.O.J. 2878 and on the chemical behavior of its juice in processing.

Factors affecting the jellation of fruit juices and pectin solutions, P. B. MYERS and G. L. BAKER (*Delaware Sta. Bul. 179 (1932)*, pp. 28, 29).—This work included the measurement of a number of the more important physicochemical properties of pectin.

The muslin tube fruit juice filter, R. B. HICKOK and R. E. MARSHALL (*Michigan Sta. Quart. Bul.*, 15 (1933), No. 3, pp. 191–197, figs. 3).—The device described consists essentially of a muslin tube about 3 in. in diameter, about 3 ft. in length, closed at one end by folding and tying, and attached at the other end to a rubber hose bringing the cider from a tank placed at such a level as to give a net head not exceeding 15 ft. It was found advantageous to support the filter tube on copper wire screening in a wooden trough inclined slightly from the horizontal. Details of construction are shown in a drawing and a photographic plate. The device is designed for the filtration of cider from which the suspended matter has been precipitated by enzyme action, and to which a suitable filter aid has been added. Cider treated as described could be filtered at the rate of about 3.3 gal. per minute during the flow of the first 5 gal. at a net head of 14 ft., the rate decreasing gradually with increase in the thickness of the filter cake. The possibility of applying the method, with suitable modification, to such other home products as vinegar and various fruit juices is pointed out.

Oil content of nine varieties of soybean and the characteristics of the extracted oils, G. S. JAMIESON, W. F. BAUGHMAN, and R. S. MCKINNEY (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 1, pp. 57, 58).—The authors of this contribution from the U.S.D.A. Bureau of Chemistry and Soils determined the oil content of seed from 9 varieties of soybeans grown in the United States, finding the quantity to range from 15.6 to 19.3 percent. The iodine number of the extracted oils determined by Hanns method ranged from 127.8 to 141.4; saturated acids ranged from 11.7 to 12.6 percent and unsaturated acids from 80.1 to 81 percent.

Differences in the amino acid content of the chief protein (glycinin) from seeds of several varieties of soybean, F. A. CSONKA and D. B. JONES (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 1, pp. 51–55).—The authors of this contribution from the U.S.D.A. Bureau of Chemistry and Soils determined colorimetrically the cystine, tryptophane, and tyrosine contents of glycinin preparations extracted from 10 varieties of soybeans. The glycinin preparations agreed fairly closely in composition but showed some significant differences. The tryptophane values ranged from 1.89 percent in the protein of the Mammoth Yellow variety to 2.84 percent in that of the Illini variety. The cystine values ranged from 0.74 percent in the protein of the Illini variety to 1.46 percent in that of the Chiquita variety. These variations in composition are attributed to variations in the proportionate quantities of the various globulins contained in the glycinin preparations.

It is noted that the Illini variety, because of its higher tryptophane content, should be of value as a supplement to feeds low in tryptophane, such as corn and oats; and that feeds deficient in cystine, such as cowpeas, lentils, and peas, should be improved more by supplementing with Chiquita and Manchu soybeans than by additions of the Peking and Illini varieties, which are comparatively low in cystine.

The mechanism of sulfur lability in cysteine and its derivatives.—I, Some thio ethers readily split by alkali. II. The addition of mercaptan to benzoylaminocinnamic acid derivatives, B. H. NICOLET (*Jour. Amer. Chem. Soc.*, 53 (1931), No. 8, pp. 3066–3072; *Jour. Biol. Chem.*, 95 (1932), No. 2, pp. 389–392).—The author of this contribution from the U.S.D.A. Bureau of Dairy Industry describes in the first of the two papers here noted certain β -ketonic sulfides which are very readily split by alkali to give mercaptans and α , β -unsaturated ketones. A structural analogy between these compounds and cysteine or cystine is pointed out, and some reasons are given for considering as analogous the action of alkali on the two classes of compounds. "From these considerations, a mechanism for the alkaline decomposition of cysteine has been developed, and reasons have been indicated for the anticipation of greatly increased reactivity in certain specified types of cysteine and cystine derivatives."

The second paper records the preparation of ethyl α -benzoylamino- β -tolylmercaptan- β -phenylpropionate from 2-phenyl-4-benzal-5-oxazolone and p-tolylmercaptan in benzene solution by treatment with sodium ethylate solution; of the corresponding methyl and butyl esters; and, from the last-named ester, of a compound "presumed to be the sulfone of the butyl ester", obtained by oxidation with acidified permanganate in chloroform solution. Treatment of the above-named azlactone in benzene solution with sodium ethylate in absolute alcohol solution under specified conditions readily produced ethyl α -benzoylamino- β -phenylpropionate in good yield.

The tyrosine content of cocoons of various species, A. K. SILBERMAN and H. B. LEWIS (*Jour. Biol. Chem.*, 95 (1932), No. 2, pp. 491–494).—The authors of

this contribution from the University of Michigan found a high content of tyrosine in many of the species studied, these including the American tent caterpillar (*Malacosoma americana*) and a number of other species not concerned in the production of commercial silk. However, "a high tyrosine content is not an invariable characteristic of the proteins of the cocoon, since in a number of species, values for tyrosine comparable to those of more common proteins were obtained." The cocoons of Glover's silk moth (*Samia gloveri*) yielded 12.36 percent of tyrosine on the basis of the moisture- and ash-free protein, as against 9.75 percent from the silk proteins of *Bombyx mori*.

Studies of the peptides of trivalent amino acids.—II, Titration constants of tyrosyl-tyrosine and of glycyl-tyrosine, J. P. GREENSTEIN (*Jour. Biol. Chem.*, 95 (1932), No. 2, pp. 465-475, fig. 1).—Continuing this series of contributions (E.S.R., 67, p. 196), the author here presents his determinations of the apparent dissociation constants of tyrosyl-tyrosine and of glycyl-tyrosine at 25° C.

He further shows "that the assignment of the pG' value of about 10 to the feebly acid hydroxyphenyl group in tyrosine is consistent with the behavior of the peptides of this acid. The dissociation of the hydroxyphenyl group depends upon its relative position in the molecule with reference to other free groups, being increased slightly by proximity to an amino and decreased slightly by the nearness of a carboxyl group. The free amino and carboxyl groups in the tyrosine peptides are weaker as compared with similar groups in the amino acid. The isoelectric points of the complexes are likewise more acid than that of tyrosine itself."

Some factors involved in the biological production of acetone and butyl alcohol, L. WEINSTEIN and L. F. RETTGER (*Jour. Bact.*, 25 (1933), No. 2, pp. 201-238, fig. 1).—An alcohol-soluble protein or closely allied or associated substance appeared necessary for normal acetone and butyl alcohol production from carbohydrates in a semisynthetic medium. H-ion concentration, method of anaerobiosis, oils, concentration of peptone, and type of medium used had no apparent influence on the production of butyl alcohol from carbohydrate in a semisynthetic medium to which a prolamine in some form had not been added. In the presence of prolamine, or prolamine-allied substance, acetone and butyl alcohol were formed from xylose, arabinose, and glucose in the ratio 1:2. In the absence of the alcohol-soluble protein, normal quantities of acetone were produced, but little or no butyl alcohol was formed. The acid hydrolysis of the various raw materials used gave good yields of reducing sugars; and a second and more vigorous hydrolysis increased the total sugar yield materially. Fermentation of the acid hydrolyzates in the absence of a prolamine yielded appreciable quantities only of acetone. The addition of yellow corn containing the alcohol-soluble protein, zein, resulted in the production of relatively large quantities both of acetone and of butyl alcohol.

"Prolamine probably does not act as a catalyst in the reaction, or at least solely as a catalyst. Butyl alcohol is not derived from the prolamine. Alcohol-soluble proteins in all probability influence favorably the production of butyl alcohol from carbohydrate material in a semisynthetic medium through a combination of their physical action and their direct influence on the metabolism of *Clostridium acetobutylicum*."

On the preparation of hemolytic and precipitating sera, H. J. STAFSETH (*Science*, 76 (1932), No. 1976, p. 444; *abs. in Michigan Sta. Quart. Bul.*, 15 (1933), No. 3, p. 208).—Blood serum was found an entirely satisfactory substitute for red corpuscles when used as an antigen in the production of hemolytic sera. The practical value of this observation—namely, the superiority

of sterile serum to whole blood or washed red corpuscles in keeping quality—is noted. Rabbits immunized with red corpuscles also yielded good precipitating sera. It was shown that extracts of washed liver or spleen tissue are not satisfactory for the production of precipitins and hemolysins, however.

Lethal effect of alternating current on yeast cells, R. L. TRACY, JR. (*Jour. Bact.*, 24 (1932), No. 6, pp. 423-438, figs. 5; also *California Sta., Calif. Com. Relat. Elect. Agr., Prog. Rpt. 19* (1932), pp. 423-438, figs. 5).—Lethal temperatures for 1, 5, and 15 minutes were first quantitatively determined for a strain of *Saccharomyces ellipsoideus* in grape juice; and it was then shown that “by passage of alternating current through yeast cell suspensions in grape juice at nonlethal temperatures, 42° C., pronounced killing effects were obtained, indicating that alternating current of 60 cycles exerted a lethal action independent of temperatures.” The lethal effect of the current varied with the current density and with the quantity of electricity applied. Electrically treated grape juices were not toxic nor lacking in nutrient values for yeast after exposures of 30 minutes. The gases evolved from the electrolysis were not toxic to yeast cells.

“It is possible that the killing effect exerted by alternating current on yeast cells is caused by the formation of temporary toxic substances like free chlorine, and that these are immediately reduced upon cessation of the current, and thus disappear. Such an action as this would directly follow the electrical conditions determined as necessary for killing the yeast cells.”

Application of statistics to problems in bacteriology.—I, A means of determining bacterial population by the dilution method, H. O. HALVORSON and N. R. ZIEGLER (*Jour. Bact.*, 25 (1933), No. 2, pp. 101-121).—The development of equations for use in the interpretation of dilution data is shown, and with them are given tables of exponential functions and reciprocals and a probability table.

Isolation of “oryzanin” (antineuritic vitamin) from rice-polishings, I, II, S. OHDAKE (*Bul. Agr. Chem. Soc. Japan*, 8 (1932), Nos. 1-3, pp. 11-46, pls. 2, figs. 43; 7-9, pp. 111-119, pls. 2, figs. 5).—The first of these two papers is a more detailed report of an investigation noted from a preliminary report (E.S.R., 66, p. 691). Further investigation of the chemical nature of the crystals isolated from active oryzanin showed the presence of sulfur, and consequently the formula suggested for the crystalline vitamin hydrochloride has been changed to $C_{12}H_{16}N_4SO_2 \cdot HCl$.

The second paper reports the preparation of the hydrochloride, picrolonate, picrate, chloraurate, and chloroplatinate of oryzanin, with their physical and chemical reactions and percentage composition. The free base was also obtained as a hygroscopic amorphous substance soluble in water, alcohol, methyl alcohol, and acetone, but insoluble in ether and benzene. The analytical results agreed in all cases with the formula $C_{12}H_{16}N_4SO_2$ for the base substance as given in the report noted above.

The purified hydrochloride crystallized in colorless long plates, melting with decomposition at from 249° to 250° C., uncorrected. In this form it cured and protected both pigeons and rats from polyneuritis in daily doses of from 0.005 to 0.01 mg.

Microphotographs are given of the crystals of the various vitamin salts, together with the ultraviolet absorption spectrum of the hydrochloride.

Chemical investigations on vitamin B₁ [trans. title], H. MISAWA (*Jour. Biochem.*, 15 (1932), No. 3, pp. 439-471, figs. 24).—Following the method of Jansen and Donath (E.S.R., 57, p. 489), with particular attention to the adjustment of the H-ion concentration of the medium at the adsorption stage

as recommended by Salmon, Guerrant, and Hays (E.S.R., 61, p. 91), the author obtained a crude crystalline preparation of vitamin B (B_1) which protected pigeons in doses of 0.007 mg daily and had a rat unit value of 0.02 mg. The strength of various reactions such as the Pauly, Jendrassik, and Folin and Denis tests was not decreased in the successive fractions. Other tests indicated that pure vitamin B_1 contains no phosphorus and is optically inactive. A concentrated solution of the vitamin in absolute alcohol was found to give two absorption bands at from 360 to 310 $m\mu$ and from 280 to 250 $m\mu$.

A relatively simple method is described for preparing from rice germs a concentrate for therapeutic use. The adsorption product on acid clay is brought to a total acidity of 5 percent, treated with a solution of 50 percent phosphotungstic acid in 5 percent sulfuric acid, and allowed to stand overnight in the refrigerator. The precipitate is then filtered with suction, washed with 5 percent sulfuric acid, transferred to a mortar, ground with a small volume of water and a slight excess of solid barium hydroxide, and filtered again with suction into 15 cc of M H_2SO_4 . The residue is treated twice in the same manner, and the combined filtrates, after neutralization with saturated barium hydroxide and complete removal of the excess barium sulfate, are concentrated at a low temperature (about 50° C.) in a vacuum and the resulting precipitate dried in a sulfuric acid desiccator. The yield from 2 kg of rice germs is from 3.06 to 3.47 g of a strongly hygroscopic yellowish brown resinous material which forms in 2 percent solution in water a clear yellowish brown neutral solution. From the pigeon dosage of 0.5 mg per day the dosage for human therapy is calculated as 0.15 g. When dissolved in 1 to 2 percent salt solution the material can be injected subcutaneously, with no discomfort, and in this form is called Embrin.

The reducing capacity of plant food materials and its relation to vitamin C, I-V [trans. title] (*Ztschr. Untersuch. Lebensm.*, 63 (1932), Nos. 1, pp. 1-30; 3, pp. 241-283, fig. 1).—Five papers are presented.

I. *The reducing substance of lemon juice* [trans. title], J. Tillmans, P. and W. Hirsch (pp. 1-21).—Observations that vitamin C-containing plant substances have a reducing capacity toward 2,6-dichlorophenolindophenol suggested that the reducing substance responsible for this reaction is related to or identical with vitamin C. This paper reports attempts to isolate the reducing substance and establish its identity with vitamin C by comparing the reducing capacity of the various fractions with their antiscorbutic activity. The method followed involved decitration of large quantities of lemon juice by decomposition with sulfuric acid and neutralization with calcium carbonate and successive treatment with acetone, barium hydroxide, lead acetate, acetic acid and ether, and acetone. The reducing capacity of the various fractions toward 2,6-dichlorophenolindophenol was determined by a titration with the indicator as oxidant in acetic acid-sodium acetate buffer solution at pH 7, at which pH value the indophenol compound was deep blue in the oxidized, colorless in the reduced, state. The end point was a blue color, permanent for 1 minute.

Although attempts to obtain the concentrate in crystalline form were unsuccessful, the final concentrate corresponded in chemical properties to the known properties of concentrates of vitamin C and protected guinea pigs against scurvy at a dosage with a reducing value corresponding to that of 1 cc of fresh lemon juice.

The authors conclude that the reducing substance is the carrier of the antiscorbutic properties of lemon juice. A note added in proof calls attention to the similarity in properties between the reducing substances and the hexuronic acid of Szent-Györgyi.

II. *The question as to whether the reducing material of lemon juice acts as a stabilizer for the real vitamin* [trans. title], J. Tillmans, P. Hirsch, and F. Siebert (pp. 21-30).—Attention is called to the hypothesis advanced by Zilva (E.S.R., 60, p. 595) that the reducing substance in lemon juice acts as a stabilizer for vitamin C. An investigation of this possibility is reported, with the conclusion that the effect of vitamin C is due to the reducing substance and its primary oxidation product and that the first stage of the oxidation is probably reversible.

III. *The content of various fruits and vegetables in the reducing substance* [trans. title], J. Tillmans, P. Hirsch, and J. Jackisch (pp. 241-267).—This paper reports a comparison of the reducing capacity of various plant materials as determined by titration with 2,6-dichlorophenolindophenol with the vitamin C content of the same materials as reported by Scheunert (E.S.R., 62, p. 395) and Von Hahn (E.S.R., 68, p. 860).

Four methods of extraction were tested. The finely divided material was allowed to stand in an atmosphere of nitrogen for 24 hours in water or from 2 to 3 percent of sulfuric acid or heated in the same solvents for 10 minutes. Of the four methods, the extraction obtained by heating with sulfuric acid in general gave the highest values. The technic for the extraction and subsequent titration is described in detail. In the tabulated data figures are given for the so-called titration value or the number of cubic centimeters of the blue 0.001 N solution decolorized by the hot sulfuric acid extract from 10 g of the material and for the comparison value obtained by dividing the titration value by the corresponding guinea pig units, as reported by Von Hahn.

In general the titration values showed satisfactory agreement with the antiscorbutic activity. Discrepancies in the values for preserves were attributed to dissolved metallic salts. The method proved unsatisfactory for green leafy vegetables on account of the presence of other reducing substances.

Iodine titration values were also obtained but proved less specific.

IV. *The reversibility of the oxidation of the reducing substance in lemon juice* [trans. title], J. Tillmans, P. Hirsch, and H. Dick (pp. 267-275).—A study of the behavior of the reducing material in lemon juice toward various oxidizing agents is reported, with the conclusion that the oxidation is reversible with 2,6-dichlorophenolindophenol, iodine, and hydrogen peroxide, although on long standing the oxidized material undergoes irreversible changes. With chlorine the oxidation may be reversible or irreversible and with atmospheric oxygen is always irreversible. A note added in proof calls attention to the agreement between these findings and those reported by Szent-Györgyi for his hexuronic acid.

V. *The antiscorbutic action of various extracts of cucumber* [trans. title], J. Tillmans, P. Hirsch, and J. Jackisch (pp. 276-283).—To study further the difference in reducing values of extracts of plant materials obtained as noted in the third paper, the antiscorbutic properties of cold water and hot sulfuric acid extracts of cucumber were tested on guinea pigs. The antiscorbutic properties of the extracts ran parallel to their reducing values. The low reducing value obtained with the water extract is attributed to the presence of some of the reducing material in a reversible oxidized form as shown by titration with hydrogen sulfide.

Vitamin C [trans. title], J. TILLMANS and P. HIRSCH (*Biochem. Ztschr.*, 250 (1932), No. 1-6, pp. 312-320).—This refutation of the theory of Rygh and Rygh concerning the nature of vitamin C is essentially a summary of the series of studies noted above.

Narcotine and vitamin C [trans. title] O. DALMER and T. MOLL (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 209 (1932), No. 4-6, pp. 211-230, fig. 1).—Data are reported refuting in every detail the conclusion of Rygh et al. concerning the relationship of narcotine to vitamin C (E.S.R., 67, p. 648).

A footnote added in proof states that a preparation of hexuronic acid has been tested for antiscorbutic properties with positive results.

Critical review of recent work on vitamin C [trans. title], E. OTT and K. PACKENDORFF (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 210 (1932), No. 1-2, pp. 94-96).—In view of the disputed question as to the relationship of vitamin C to narcotine, the authors attempted to repeat the work of Rygh (E.S.R., 67, p. 648), making use also of the Tillmans reducing test for determining antiscorbutic activity as noted on page 8.

Attempts to isolate narcotine from lemon juice were occasionally but not always successful. An unknown substance was consistently obtained which crystallized in needles melting at 121° C. It was neutral in reaction and contained a methoxy group but no nitrogen. The water-soluble fraction of the ether extract contained a reducing substance which gave the Tillmans test for antiscorbutic activity, and also showed chemical properties identical with those of hexuronic acid obtained from glucose and mannose.

The nature of vitamin C [trans. title], J. TILLMANS (*Ztschr. Untersuch. Lebensmtl.*, 64 (1932), No. 1-2, pp. 11-20).—The author reviews in considerable detail recent research on the chemical nature of vitamin C, including the work of Bezssonoff, Zilva, Rygh, and Szent-Györgyi, and his own studies. In his opinion the hexuronic acid of Szent-Györgyi is identical with the reducing substance which he has postulated as the cause of antiscorbutic activity in plant materials. The properties of the reducing substance which are in close agreement with hexuronic acid are as follows: It is an organic carboxylic acid, contains no nitrogen, and is not a tannin or polyphenol. It is closely related to carbohydrates, for the Molisch reaction is positive. It has typical oxidizing reducing properties, the reaction being reversible with indophenol, hydrogen peroxide, and iodine, and irreversible with oxygen. It appears to be an oxygen catalyzer and as such plays a role in the oxidation processes of the cells. The minimum daily protective dose for guinea pigs has been found to be from 0.6 to 1 mg for the reducing principle, and is stated to be about 1 mg for hexuronic acid.

Structural formulas for hexuronic acid and the two oxidized forms are given as follows: Hexuronic acid— $\text{CH}_2\text{OH.CO.CHOH.CHOH.CHOH.COOH}$; reversible oxidized hexuronic acid— $\text{CHO.CO.CHOH.CHOH.CHOH.COOH}$; and irreversible oxidized hexuronic acid— $\text{COOH.CO.CHOH.CHOH.CHOH.COOH}$. It is noted, however, that the proposed formula may not apply to the crystalline form, which probably contains the lactone grouping with the splitting off of a molecule of water. Inability to obtain crystals from the reducing substance is attributed to the failure as yet to obtain the substance in the lactone form.

The non-specificity of the phenolindophenol reducing capacity of lemon juice and its fractions as a measure of their antiscorbutic activity, S. S. ZILVA (*Biochem. Jour.*, 26 (1932), No. 5, pp. 1624-1627).—In this reply to the various papers of Tillmans et al. leading to the conclusion that the phenolindophenol reducing capacity of plant materials is due to vitamin C itself, a comparison is reported of the reducing capacity of phenolindophenol and the antiscorbutic potency as determined on guinea pigs of a large number of samples of decitrated lemon juice used in the author's extensive research on vitamin C over a period of five years (E.S.R., 66, p. 113).

The data, as grouped by increasing reducing values, showed no consistent relationship. With the solutions of highest reducing value little or no antiscor-

butic protection was obtained in five tests involving about 15 guinea pigs. At the other extreme a fair degree of protection was obtained in three tests comprising about 9 guinea pigs on daily doses showing low reducing capacity.

Narcotine as the alleged precursor of vitamin C, R. L. GRANT, S. SMITH, and S. S. ZILVA (*Biochem. Jour.*, 26 (1932), No. 5, pp. 1628-1632, pl. 1).—A further refutation of the results obtained by Rygh and his collaborators is reported in the attempted isolation of narcotine from the juice of unripe oranges, the attempted preparation of an antiscorbutic concentrate from lemon juice by the method of Rygh et al. (*E.S.R.*, 67, p. 648), and in the examination of methyl nornarcotine for antiscorbutic activity. Two tests with methyl nornarcotine were reported, in one of which the material was prepared under strictly anaerobic and in the other less strictly anaerobic conditions. The substances were subjected to chemical as well as biological tests. In all of the tests negative results were obtained. Attention is called in a footnote to the fact that there is no evidence that unripe fruits or vegetables have a lower vitamin C concentration in their juices than ripe ones.

The vitamin C activity of hexuronic acid from suprarenal glands, W. A. WAUGH and C. G. KING (*Science*, 76 (1932), No. 1983, p. 630).—This is a brief note announcing that hexuronic acid prepared by E. C. Kendall from suprarenal glands by a different procedure from that followed in the author's laboratory (*E.S.R.*, 67, p. 649) corresponded with their own product in crystalline form, melting point, reducing value, titration equivalent, and rotatory power, and in biological activity. The minimum protective dose was slightly over 0.5 mg daily. "The procedure for isolating the hexuronic acid from suprarenal glands involved an ether extraction of the solution when neutralized by sodium bicarbonate. This would have removed such a substance as the *o*-diphenol derivatives of narcotine, which has been considered by Rygh to be identical with vitamin C."

Chemical investigations on the antiscorbutic vitamin, III [trans. title], O. and A. RYGH (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 211 (1932), No. 6, pp. 275-284, fig. 1).—In continuation of the series noted previously (*E.S.R.*, 67, p. 648), a theory reconciling the antiscorbutic activity of methyl nornarcotine and the hexuronic acid of Szent-Györgyi is proposed on the basis of observations that in guinea pigs on a scorbutic diet glucuronic acid gradually disappeared from the urine, and that while the addition of 0.5 mg of glucuronic acid to the scorbutic diet did not prevent scurvy, the further addition of traces (0.01 mg of a 30 percent solution) of methyl nornarcotine to the same amount of glucuronic acid afforded protection against scurvy and promoted normal growth in litter-mate controls. It is also noted that methyl nornarcotine alone has cured severe cases of human scurvy.

These findings are thought to indicate that antiscorbutic activity is due to a combination of glucuronic acid with methyl nornarcotine. In man external sources of glucuronic acid are not required, while they are in the guinea pig. The hexuronic acid of Szent-Györgyi is assumed to be glucuronic acid, together with a trace of methyl nornarcotine which accompanies it throughout the various steps of the purification process. The occasional solubility in ether of the vitamin C of fruit juices is explained on the ground that, although free methyl nornarcotine is insoluble in ether, its compound with glucuronic acid is somewhat soluble.

Methylnornarcotine, glycuronic acid, and vitamin C, W. J. DANN (*Nature [London]*, 131 (1933), No. 3297, pp. 24, 25).—A preliminary note reporting failure to confirm observations of Rygh and Rygh noted above.

Crystalline structure of hexuronic acid, E. G. COX (*Nature [London]*, 130 (1932), No. 3275, pp. 205, 206).—A brief description is given of the crystalline

structure of hexuronic acid as determined by X-ray examination by the single crystal rotation method. Purified crystals proved to be identical with the crystalline portion of the original substance as isolated by Szent-Györgyi (E.S.R., 67, p. 645). The crystalline properties are such as to suggest that "the hexuronic acid molecule has a ring structure with fewer groups projecting out of the plane of the ring than a normal carbohydrate and contains double bonds, possibly in carbonyl groups."

Hexuronic acid as the antiscorbutic factor, E. G. COX, E. L. HIRST, and R. J. W. REYNOLDS (*Nature [London]*, 130 (1932), No. 3293, p. 888).—In this further note on the chemical behavior of the hexuronic acid of Szent-Györgyi, the authors propose the following structural formula as best accounting for the observed properties: $\text{CH}_2\text{OH}.\text{CHOH}.\text{CH}_2\text{CO}.\text{CO}.\text{COOH}$. It is thought that the substance can react in the enol modification $\text{CH}_2\text{OH}.\text{CHOH}.\text{CH}:\text{COH}.\text{CO}.\text{COOH}$.

"Hexuronic acid" (ascorbic acid) as the antiscorbutic factor, A. SZENT-GYÖRGYI and W. N. HAWORTH (*Nature [London]*, 131 (1933), No. 3297, p. 24).—The authors propose the name ascorbic acid for the crystalline substance $\text{C}_6\text{H}_8\text{O}_6$ hitherto designated as a hexuronic acid. The reasons given for this change are that "(1) hexuronic acid is the name of a class of substances rather than that of one individual compound, and that (2) the material described as hexuronic acid isolated from adrenal cortex and now from paprika contains a molecule of water less than is required for a hexuronic acid."

Ascorbic acid as vitamin C (*Lancet [London]*, 1933, I, No. 9, p. 484).—In this editorial comment, attention is called to the similarity between the present claim that the hexuronic acid of Szent-Györgyi, ascorbic acid, is the antiscorbutic vitamin and the earlier claims with regard to cholesterol and carotene as the provitamins for vitamin D and vitamin A, respectively. It is noted that the verdict was not the same in the two earlier cases, but that the consensus of opinion is that ascorbic acid is identical with vitamin C. A further comparison is made between the failure in attempts to isolate vitamin A in a comparatively pure state until a richer source than cod-liver oil had been found in the form of halibut-liver oil and similar difficulty in obtaining sufficient ascorbic acid from adrenal glands in comparison with the ease with which a large quantity has been prepared recently from a newly discovered rich source of the vitamin, a Hungarian red pepper (*Capsicum annum*).

The phosphorus content of casein.—Preliminary paper, R. E. L. BERGGREN (*Jour. Biol. Chem.*, 95 (1932), No. 2, pp. 451-460, figs. 3).—The preliminary experiments reported upon were designed to indicate whether or not the phosphorus content of a casein preparation is influenced by the phosphate content of the milk from which the protein is precipitated. The phosphorus-nitrogen ratio was shown to be 0.0522 and 0.0558, respectively, in two preparations of which the first was made by adding dilute hydrochloric acid to the fresh milk until the isoelectric point (pH 4.6) was reached, the second by leaving the milk in the refrigerator until casein separation was complete as a result of souring; whereas two casein preparations obtained by first dialyzing the milk against distilled water in a refrigerator for 12 days in a collodion membrane (thymol as preservative), with subsequent precipitation by adding hydrochloric acid to bring the pH to 4.6, had the phosphorus-nitrogen ratios 0.0444 and 0.0215.

The application of the Fiske-Subbarow colorimetric method to the determination of phosphorus in casein, R. E. L. BERGGREN (*Jour. Biol. Chem.*,

95 (1932), No. 2, pp. 461-464).—The author weighed quantities approximating 1.5 g. of casein into 100-cc volumetric flasks, and dissolved these samples by adding to each 30 cc of 0.1 N sodium hydroxide and diluting the resulting solutions to volume. One cc aliquots from such solutions were evaporated to dryness and ashed at just a red heat in platinum, treated with a few drops of water and one drop of saturated magnesium nitrate solution, and again evaporated and ignited. After due precaution to insure the absence of nitrites, the Fiske-Subbarow method (E.S.R., 55, p. 310) was applied to the solutions of the ash thus prepared.

An average of the results obtained with nine different casein preparations gave 0.8 percent phosphorus by the colorimetric method and 0.805 percent by the gravimetric method.

A new color test for cysteine, E. DYER and O. BAUDISCH (*Jour. Biol. Chem.*, 95 (1932), No. 2, pp. 483-489).—The authors show that the appearance of a red color in the chloroform layer when an aqueous solution of cysteine hydrochloride is shaken with a chloroform solution of *o*-benzoquinone furnishes a simple specific test for cysteine. This reaction may be used for detection of cysteine in the presence of cystine, glutathione, and many other sulfur and nitrogen compounds, and its application as a test for cystine by first reducing it to cysteine was also shown to be practicable.

The electrometric determination of chlorides in soils by the silver-silver chloride electrode, E. F. SNYDER (*Soil Sci.*, 35 (1933), No. 1, pp. 43-48).—Having outlined the theoretical basis for the titration of the chloride ion with the silver-silver chloride electrode in combination with a quinhydrone reference electrode as indicator, the author of this contribution from the U.S.D.A. Bureau of Chemistry and Soils prescribes a procedure essentially as follows:

Place in a 150-ml beaker 5 g of soil, passing a 50-mesh sieve, and 50 ml of distilled water. Increase the sample to 10 g for small quantities of chlorine and decrease for large quantities. Of a soil extract make up an aliquot to approximately 50 ml with distilled water. Let the Ag-AgCl electrode and agar bridge reach nearly to the bottom of the beaker and stir the suspension continually by means of an electric stirrer during the determination. Add dropwise to the suspension or extract sufficient sulfuric acid (1+2) just to redden a strip of thymol blue paper, about pH 2, and maintain this reaction. At the end of 10 minutes close the circuit momentarily and observe the galvanometer deflection, from which an approximation may be had of the volume of N/35.457 silver nitrate required. "During the course of a titration, particularly on the soil extract, it may be necessary occasionally to wash the electrode free from any adhering silver chloride." Add silver nitrate, with subsequent adjustment of the potentiometer, until the galvanometer deflection just reverses, indicating the end-point. "It is desirable to continue the determination 5 minutes longer to be sure the end-point is constant. The silver nitrate solution is made up as N/35.457 so that 1 ml is equivalent to 1 mg of chlorine. An N/35.457 potassium chloride solution may be used for back titration if necessary."

A method for determining the quantity of mineral oil retained by leaf surfaces after spraying, L. H. DAWSEY and A. J. HAAS, JR. (*Jour. Agr. Res.* [U.S.], 46 (1933), No. 1, pp. 41-49, figs. 2).—The oil left on camphor leaves after spraying with emulsions containing highly purified mineral oil was removed from a number of disks of known area by solution in ether, the natural leaf oils and waxes dissolved with the mineral oil being destroyed by treatment with nitric acid, after which the mineral oil was measured in calibrated Babcock skim milk bottles. With certain variations the method was applicable to pecan and Satsuma orange leaves. The maximum error was found to be less than 1 percent in the case of pecan leaves and less than 2.5 percent with camphor and orange leaves. An example shows residues varying

from 0.1 to 0.24 mg per square centimeter after the use of various emulsions, in which the oil concentration was kept constant at 1.6 percent but the emulsifier concentration ranged from 0.003 to 0.0004 N sodium oleate.

AGRICULTURAL METEOROLOGY

Agricultural meteorological scheme.—Bibliography of literature on agricultural meteorology, Sects. 1-4 (*London: Min. Agr. and Fisheries*, [1931], sects. 1, pp. [88]; 2, pp. [320]; 3-4, pp. 123+17).—This mimeographed document gives all available summaries and extracts of literature dealing with agricultural meteorology and allied subjects which have appeared in the crop weather reports of the British Ministry of Agriculture and Fisheries from the inception of the Agricultural Meteorological Scheme (E.S.R., 62, pp. 403, 611) in 1924 to the end of September 1930, with author and subject indexes.

Meteorology, E. V. NEWNHAM (*Sci. Prog.* [London], 27 (1932), No. 106, pp. 237-244).—This is a critical review, mainly of Köppen's classification of climates.¹ The classification is stated to be based primarily on temperature and rainfall and the seasonal variation of these two elements as related to typical soils and vegetation, and is referred to as "probably the one most often used in investigations into the agricultural possibilities of different parts of the world." [The classification takes little account of sunlight as a climatic factor.]

The moon and weather forecasting [trans. title], J. ROUCH (*Rev. Sci.* [Paris], 71 (1933), No. 2, pp. 48, 49).—This article refers briefly to observations by J. Bertho on the island of Réunion and in the surrounding regions, from which he developed a method of forecasting weather (cyclones) based on phases and declination of the moon and its distance from the earth. A high degree of accuracy of the method is indicated.

What will the winter be? (*Bul. Amer. Met. Soc.*, 14 (1933), No. 1, pp. 17, 18).—Reference is made to a typewritten report on a study by J. R. Weeks of the 115-year weather records of Baltimore and Philadelphia, from which the reviewer concludes that "an annual forecast for the coming winter would be impossible, for the verification would be entirely too small, but the correlation could and should be used when autumn or October or summer departures are sufficiently large."

World weather, V, G. T. WALKER and E. W. BLISS (*Mem. Roy. Met. Soc.*, 4 (1932), No. 36, pp. 53-84, figs. 19; abs. in *Sci. Abs.*, Sect. A—Phys., 36 (1933), No. 422, pp. 132, 133).—A study, the fifth of a series (E.S.R., 63, p. 415), of variations in the so-called North Atlantic, North Pacific, and southern oscillations as related to pressure, temperature, and rainfall over wide regions, as well as to sun spots, is reported. It was found that the southern oscillation in the southern winter is extremely persistent and its departure has a correlation coefficient of 0.84 with that of the following summer, thus providing a possible basis for forecasting seasonal conditions. The effects of Antarctic conditions and of ocean temperatures are considered, but without conclusive results as to the physical basis for the oscillations.

Climatological summary for Wooster and Ohio for the year 1931, C. A. PATTON (*Ohio Sta. Bul.* 516 (1933), pp. 123-128).—Data for temperature, precipitation, and length of the growing season at the experiment station, Wooster, and for the State at large, for 1931, are summarized as for previous years (E.S.R., 67, p. 12).

¹ Grundriss der Klimakunde. Berlin: Walter de Gruyter & Co., 1931, pp. XII+388, pls. 9, figs. 28.

A detailed study of desert rainfall, R. R. HUMPHREY (*Ecology*, 14 (1933), No. 1, pp. 31-34, figs. 2).—Results of a detailed study of variations in rainfall during the year ended August 28, 1931, with rain gages distributed at 100-m intervals on a relatively small area on the grounds of the Desert Laboratory of the Carnegie Institution of Washington, at Tucson, Ariz., are briefly summarized. It was observed that the mean annual rainfall varied for almost all of the gages, in some cases widely. This is attributed, however, to great local variations in certain of the heaviest showers rather than consistent differences in precipitation. A slight but progressive increase of rainfall with increasing altitude was observed up to 600 ft. above the plain. Winter rains tended to be more uniform, of longer duration, and less intense than summer rains. The area on which the observations were made included both level and sloping land.

Temperature of air layers near the soil [trans. title], H. KARSTEN (*Acta Agr. Fennica*, No. 26 (1932), pp. 71, figs. 22).—Previous investigations are reviewed, and studies made by the author in 1931 at Perkjarvi, in Finland, are reported in detail. The report is of special interest from the standpoint of methods of collecting, analyzing, charting, and interpreting the data and for its discussion of the complex character of the problem, which makes reliable conclusions difficult.

Storm injuries [trans. title], H. BURGER (*Mitt. Schweiz. Centralanst. Forstl. Versuchsw.*, 17 (1932), No. 2, pp. 341-376, pls. 6, figs. 8).—Storm injuries to forest growth in Switzerland during the past 50 years, particularly those caused by winds, are summarized and discussed. It is stated that during the 50 years covered by this study about 3,000,000 m³ of timber has been thrown down by the wind, and that this windfall has contributed from 2 to 2.5 percent of the forest growth used annually. The general wind conditions, some of the more destructive storms, and characteristic injuries are described.

The influence of climatic factors on the variations of yield [trans. title], F. ENQUIST (*Svensk Geogr. Årsbok*, 1932, pp. 122-146, figs. 12; *Eng. abs.*, pp. 144-146).—The results of a statistical study of yearly, secular, and geographic variations in weather and climate in Sweden and other European countries as related to yield of crops, particularly Swedish Velvet Chaff wheat, are given in this article. Among the conclusions reached by the author is that in spite of man's efforts through soil improvement, plant breeding, and similar means to bring about systematic consecutive improvements in crop yields, changes in the climatic condition of different regions remain the decisive factor.

SOILS—FERTILIZERS

A quarter century progress in soil science, J. G. LIPMAN (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 1, pp. 9-25).—This contribution from the New Jersey Experiment Stations (E.S.R., 68, p. 427) reviews among other topics, the historical background; the origin, formation, and classification of soils; soil surveys, classification, and mapping in the United States; some European soil surveys and maps; soil chemistry, including soil acidity, base exchange, and soil colloids; soil microbiology; plant nutrition; soil erosion; lysimeter investigations; and field plats.

Methods for the examination of the soil [trans. title], edited by O. LEMMERMANN (*Ztschr. Pflanzenernähr., Düngung u. Bodenk.*, Sup. 1 (1932), pp. 90, figs. 2).—Following a brief introduction and a list of the contributing institutions, this collection of methods contains the sections (a) the taking of soil samples, (b) the physical examination of mineral and humus soils, (c) the examination of mineral soils, (d) the examination of moor lands and similar

soils, and (e) the examination of forest soils. Each of the first four sections is subdivided into various groups of determinations and tests, while the last-named section takes up only the chemical examination of forest soils.

Petrographic methods for soil laboratories, W. H. FRY (*U.S. Dept. Agr., Tech. Bul. 344* (1933), pp. 96, figs. 5).—Following an introduction dealing briefly with some of the general bases of microscopic crystallography and some related matters, the bulletin has the further main divisions of crystal form, fundamental properties of light, the petrographic microscope and accessories, optical methods, and application of methods. An appendix tabulates the optical properties of numerous examples of isotropic substances, uniaxial positive substances, uniaxial negative substances, biaxial positive substances, and biaxial negative substances.

[**Soil Survey Reports, 1928 Series**] (*U.S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1928, Nos. 25, pp. 60, pls. 3, fig. 1, maps 2; 26, pp. 38, fig. 1, map 1*).—The two survey reports here noted were prepared with the cooperation, respectively, of the Massachusetts Department of Agriculture and the Ohio Experiment Station.

No. 25. *Soil survey of Hampden and Hampshire Counties, Massachusetts*, W. J. Latimer and L. R. Smith.—Hampden and Hampshire Counties, Mass., possess a combined area of 771,200 acres in the southwestern part of the State, their lands forming a rather uneven, much dissected plateau divided about midway by the broad Connecticut Valley lowland which runs north and south across the combined area. Most of the numerous soil types have well established drainage.

So large a variety of soils is represented in this area that of the 43 types of 26 series mapped and described the most extensive, Gloucester stony fine sandy loam, embraces only 8.1 percent. Among miscellaneous soils 7.4 percent of meadow, muck, and peat, together with 19.5 percent of rough stony land, which "furnishes much of the timber and cordwood cut within the area", were found.

No. 26. *Soil survey of Ottawa County, Ohio*, A. H. Paschall et al.—Ottawa County lies against the northern border of Ohio and has an area of 167,680 acres of lands showing in general a nearly level to gently rolling surface, covered mainly by soils of 16 series and 30 types with smaller areas of some miscellaneous soils. Of these soils, Toledo silty clay, highly productive when tile drained where artificial drainage is needed, and Fulton silty clay loam occupy 45.7 and 10.6 percent, respectively, of the total area of the county.

[**Soil Survey Reports, 1929 Series**] (*U.S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1929, Nos. 7, pp. 26, fig. 1, map 1; 8, pp. 21, fig. 1, map 1*).—These surveys were in cooperation with the Maryland Experiment Station.

No. 7. *Soil survey of Caroline County, Maryland*, H. B. Winant and S. R. Bacon.—Caroline County is an area of flat, undulating, and gently rolling lands, with short steep slopes bordering the larger streams, amounting to 204,160 acres and lying on the eastern border of Maryland. Although the central and southwestern parts of the county have in general an adequate drainage, other sections are more or less in need of drainage.

Sassafras loamy sand, Sassafras sandy loam, Sassafras loam, and Elkton loam, 20.2, 19, 13.3, and 10.6 percent, respectively, of the entire county are the more extensive soils among 15 types of 5 series. There is 5 percent of meadow and 2.2 percent of tidal marsh.

No. 8. *Soil survey of Talbot County, Maryland*, S. O. Perkins and M. Hersberger.—Talbot County is a tract of 171,520 acres of generally flat plain of which more than 30 percent has poor drainage.

The most extensive of the 9 types, here assigned to 3 series, is a silt loam of the ill-drained Elkton series amounting to 26.3 percent of the county. Keyport silt loam constitutes 20.5, and Sassafras loam 16.4 percent. There is 2.9 percent of meadow and 2.8 percent of tidal marsh.

[**Soil investigations of the California Station**] (*California Sta. Rpt. 1932*, pp. 37-39, 52-55, fig. 1).—Experimental work on the need of phosphorus and on alkali problems is very briefly summarized. The report contains also short items on a soil utilization and land-appraisal index, on subsidence of peat lands, and irrigation studies.

[**Soil and fertilizer investigations of the Delaware Station**], H. C. HARRIS, P. B. MYERS, G. M. GILLIGAN, and T. F. MANNS (*Delaware Sta. Bul. 179 (1932)*, pp. 18-20, 26, 27, 55).—The soil investigations here reported upon include a study of the H-ion concentration of soils as controlled by applications of sulfur or lime, and of soil buffer action; work on the colloidal fraction of a subsoil from the standpoint of its electrodialyzable bases; and an investigation into the effect of copper, manganese, and iron on nitrogen fixation.

[**Soil utilization tests in Georgia**] (*Georgia Coastal Plain Sta. Bul. 19 (1932)*, pp. 98-100).—Work of the Coastal Branch Station at Darien is discussed under the heads of soil type, soil management, cover crop tests, and rates and frequency of application of lime.

[**Soil and fertilizer investigations at the Indiana Station**] (*Indiana Sta. Rpt. 1932*, pp. 18, 19, 55, 65, 66, 67, fig. 1).—Report is made upon studies of the Neubauer method for determining the fertilizer needs of soils for crop plants, greenhouse comparisons of superphosphate and raw rock phosphate, and on yields and financial returns from various fertilizer treatments on the various experimental fields. Mention is made also of the performance of approximately 2,000 insoluble phosphoric acid determinations to ascertain the effect of the type of filter paper used upon the results of this determination.

[**Studies on soil problems at the Iowa Station**], P. E. BROWN ET AL. (*Iowa Sta. Rpt. 1932*, pp. 73-89, fig. 1).—Brief notes are given on findings from experiments on the effects of fertilizers on crops and soil conditions under various rotations in the Wisconsin drift soil area; the effects of fertilizing materials and methods of grazing on soil conditions and plant growth on permanent pastures; the effects of various amounts of fertilizers applied at different times in the rotation on the crops and soil conditions in the Wisconsin drift soil area; effects of various amounts of limestone of different degrees of fineness on the Tama silt loam; the relative value of red clover, alfalfa, and sweetclover as soil building crops; response of various soil types to treatments in the greenhouse; the effects of various fertilizing materials on crop growth on various soil types; the value of commercial cultures for the inoculation of legumes and nonlegumes; the fixation of atmospheric nitrogen by nonsymbiotic micro-organisms; nitrification in Iowa soils; the effect of fertilizers and various soil treatments on micro-organisms; nitrate assimilation in soils; the occurrence and activities of soil fungi in Iowa soils; the physiological characteristics of *Rhizobium*; the effect of lime and legume inoculation on crops and on soil conditions in southern Iowa; the plant food content and lime requirements of Iowa soils and the composition of various crops; base exchange in Iowa soils; the available phosphorus in Iowa soils; and the formation of humus and the decomposition of organic matter in soils.

[**Soil investigations of the New York Cornell Station**] (*New York Cornell Sta. Rpt. 1932*, pp. 92-95).—Data are given on physicochemical studies of muck soils, a study of unproductive muck, and mull and duff as biotic equilibria.

[**Soil and fertilizer investigations of the Ohio Station**], R. M. SALTER, C. J. SCHOLLENBERGER, J. W. AMES, R. BRADFIELD, G. W. CONREY, J. G. STEELE,

T. C. GREEN, F. G. LOUGHRY, H. W. BATCHELOR, and J. BUSHNELL (*Ohio Sta. Bul.* 516 (1933), pp. 30, 31-33, 34, 35, 64, 65, fig. 1).—Data are reported briefly on impurities and the agricultural value of limestone, unusual accumulation of soil nitrates in 1931, the measurement of size frequency distribution in soils, some physical factors affecting the determination of the number of nitrogen-fixing bacteria in soil, and corn and rye as green manures.

Single value soil properties of tropical soils, J. CHARLTON (*Indian Jour. Agr. Sci.*, 2 (1932), No. 1, pp. 62-85).—The existence of a high correlation between the stick point moisture (S) and loss on ignition (I) was confirmed, the values found for ^rSI and partial correlations approximating those found by Coutts (E.S.R., 64, p. 418) for 66 South African soils. Among the soil properties examined, it seems unlikely that any correlation except ^rSI could be regarded as relatively free from the influence of replaceable bases or other factors. Even in the case of ^rSI, certain factors were found to have an influence on the correlation.

“Although high correlations were found for ^rSC and ^rRI [C=clay content; R=moisture content of the soil when at equilibrium with a 50 percent moisture-saturated atmosphere], such relationships do not indicate a fundamental direct relationship in all cases when examined by partial correlations. There is little doubt, for instance, that clay percent and sticky point moisture may be inversely related in certain soils. It is believed that the variability of the relationship between clay percentage and sticky point moisture is largely controlled by the replaceable bases, although other factors may be important also.”

The increase in the value of ^rSC as a result of treatment by H₂O₂ was found to be small, whereas Keen and Coutts (E.S.R., 63, p. 510) found a large increase. This result is ascribed to the low organic matter content of the Burma soils, those examined by Keen and Coutts being supposed to contain organic matter in larger amount. “In normal arable tropical soils it follows that the sticky point moisture is largely controlled by the inorganic colloids.” Experimentally it was found that the nature of the replaceable bases exercised a very large effect on the value of the sticky point moisture, but as the ignition loss was somewhat similarly affected by change of replaceable base, the correlation SI remained high. No evidence of an increased value for the correlation ^rCI as a result of H₂O₂ treatment or with increased depth (diminished organic matter) was found.

With only one replaceable base present, the total correlations ^rSI and ^rRI were approximately perfect. Of this observation it is noted that “this indicates that even if the silica/sesquioxide ratio of soils affects the values of S, I, and R, it probably has smaller effect than change of replaceable base. On the other hand the soils worked with were from an area where the silica/sesquioxide ratio may be expected to be reasonably constant, so that soils from different types may be expected to give lower correlations even with only one replaceable base present.”

A study of the physico-chemical changes accompanying the process of reclamation in alkali soils, D. SINGH and S. D. NIJHAWAN (*Indian Jour. Agr. Sci.*, 2 (1932), No. 1, pp. 1-18, pl. 1, figs. 2).—The authors consider that to improve sodium clay soils the first essential is to convert sodium clay into calcium clay with the help of calcium salts. Leaching and drainage of such soils cannot alone bring about any permanent cure, and may in the long run do more harm than good.

“The extent of kallar trouble in such soil is measured by a ratio of sodium to calcium or a ratio between the monovalent and divalent bases present in the exchange complex. The amount of calcium salts required for the reclama-

tion of such soils depends on the sodium present in the exchange complex. The dispersion coefficient may furnish as a ready method for determining the relative amounts of exchangeable calcium and sodium in the kallar soils. With the help of calcium salts followed by a treatment of farmyard manure it is possible to improve the bari soil to the status of a normal soil."

Changes in volume that occur when dry soils are wetted with water and with chemical solutions, G. BOUYOUCOS (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 2, pp. 129-133, fig. 1).—In the experiments reported upon in this contribution from the Michigan Experiment Station the original or absolute volume of the oven-dry soils and liquids considered together decreased when the soils were brought into intimate contact with the liquids, the volume contraction being greatest in clays and in soils with a high content of organic matter. With the exception of that in potassium hydroxide solution, the volume contraction of any given soil in all the chemical solutions used was the same as that in water. That in the potassium hydroxide was much less.

The volume contraction appeared to be due to the compression of the water adsorbed by the soils. Further, "when soils are saturated with water or chemical solutions and swell and increase in volume, this increase in volume is only apparent and not real. In the real volume there is a decrease."

Solubility of the solid phase of soil in water, S. M. DRACHEV (*Soil Sci.*, 35 (1933), No. 1, pp. 75-83, figs. 2).—The author determined by an electrolytic conductivity method the quantities of soluble compounds in two series of extracts of carbonate- and gypsum-free chernozem, podsol, and gray forest soils, the soil-water ratios used respectively in the two sets of experiments being (a) 1:1, 1:4, 1:10, 1:20, and 1:100; and (b) 1:4, 1:8, 1:16, 1:32, 1:64, and 1:128.

"Between the volume of the solvent and the quantity of electrolytes exists a functional relation which can be expressed by the equation, $x=y\sqrt{V+b}$, where x represents the quantity of soluble electrolytes in milliequivalents in 100 g absolutely dry soil, V the ratio between the volume of dissolvent and the weight of soil, b the quantity (in milliequivalents) of easily soluble salts extracted from the soil by a small volume of water, y constant. The value of the constant (y) for chernozem fluctuated from 0.68 to 2.03, for podsol from 0.04 to 0.34." Observed and calculated data are tabulated. The data on sodium carbonate and humus extracted from solonetz soil with successively increasing water volumes were in agreement with the calculated values.

"The study of the solubility of phosphate minerals (apatite, phosphate rock) in water shows that the solution of these minerals to some extent follows the same rule. The constant (y) of the solubility of apatite was about the same as that of the podsol soil."

Soil acidity as a phytopedological factor, A. I. POTAPOV (*Soil Sci.*, 35 (1933), No. 1, pp. 55-73, figs. 2).—The author presents "a rough outline of a phytopedological classification in which the plant and soil are embodied in definite classes, each class having definite indexes of average normal conditions of correlations of the plant and soil", together with "examples . . . of the dynamics of phytopedological processes and methods of determining the phase into which the said process has entered together with its trend."

Base interchange induced by calcium, magnesium, and sodium nitrates in a 6-foot column of soil-subsoil, W. H. MACINTIRE, J. B. YOUNG, and W. M. SHAW (*Soil Sci.*, 35 (1933), No. 1, pp. 49-53, fig. 1).—Triplicated single, heavy, equivalent additions of sodium, calcium, and magnesium nitrates were made at the Tennessee Experiment Station to Cumberland clay loam underlaid by 5 ft. of red clay subsoil, and the outgo of bases was determined annually for a period of 9 years in 12 lysimeters.

"The replacements of calcium and magnesium by sodium were decidedly less than the reciprocal calcium-magnesium replacements shown for the two divalent nitrates. The amounts of calcium recovered from calcium nitrate and exchanged by the magnesium of magnesium nitrate were practically the same. Conversely, the recovered and exchanged quantities of magnesium from magnesium nitrate and calcium nitrate, respectively, were in close agreement. The amounts of potassium replaced by the heavy additions of sodium, calcium, and magnesium nitrates were so small as to indicate that the amounts of potassium made available by ordinary amounts of nitrates would be inconsequential."

Base-exchange modifications of a Leonardtown silt loam under fertilizer and crop control, R. S. HOLMES (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 2, pp. 161-168, fig. 1).—Chemical and physical determinations upon productive plats of Leonardtown silt loam, on which fertilizer treatment tests had been carried on for 12 years were made by the author of this contribution from the U.S.D.A. Bureau of Chemistry and Soils to determine any modifications produced in the soils by the fertilizers applied. On measuring base exchange the 0.05 N HCl and normal $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$ methods gave approximately the same results for the mono- and dibasic constituents, though Fe, Al, and P were appreciably soluble in 0.05 N HCl but practically insoluble in $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$. The above determinations show that the fertilizer treatments increased the average available P, K, Mn, Mg, and Ca and total N content of the treated plats. The results also indicate that this soil contains in its normal state adequate plant food supplies except in the case of phosphorus.

Preliminary studies of the exuded plant sap and the relation between the composition of the sap and the soil solution, W. H. PIERRE and G. G. POHLMAN (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 2, pp. 144-160).—Determinations of pH, specific resistance, and of phosphorus, calcium, nitrate nitrogen, silica, and chlorides were made at the West Virginia Experiment Station on a number of samples of sap obtained by cutting the stalk of plants near the surface of the ground and collecting the sap which exuded from the stump ends, together with a study of the relation between the concentration of various elements in the plant sap and in the soil solution obtained from the soils upon which the plants were growing. Other experiments included work on the composition of the plant sap of corn, sorghum, and Sudan grass as affected by three different degrees of soil acidity and determinations of the composition of sap samples collected on successive days.

The sap of corn was found to contain an average concentration of about 3,700 p.p.m. total solids, of which approximately one third was apparently in the inorganic form. The total phosphorus content of the sap of corn, sorghum, and Sudan grass was found to range between about 150 and 450 p.p.m. PO_4 . Of this concentration generally over two thirds and in some cases all were found to be in the inorganic form. The concentration of silica in the plant sap was found to average about 250 p.p.m., of calcium about 80 p.p.m., and of chlorides about 90 p.p.m., while nitrates were found to vary from a trace to 344 p.p.m.

Samples of sap from the same plants collected on successive days were found to remain quite constant in total phosphorus for a period of four days. The inorganic phosphate, however, was found to increase as bleeding proceeded, while the organic phosphate tended to decrease. Chlorides were found to increase in the sap as bleeding continued, but calcium and silica were not found to show any consistent variations.

The pH values of the sap of corn, sorghum, and Sudan grass were found to be about the same, varying from about 4.4 to 4.8. Differences in soil acidity

from pH 4.6 to 6.6 were not found to affect the acidity of the sap of any of the three species. The H-ion concentration of the soil was not found to affect the concentration of calcium, phosphorus, and chloride in the plant sap within a range of pH 4.6 to 6.6. With increased pH values of the soil a slightly greater concentration of silica was found in the plant sap. The total electrolyte content of the sap of corn, as measured by conductivity determinations, was found to be less in nearly all cases than that of the displaced soil solution. Phosphorus and silica were found in much higher concentrations in the plant sap than in the displaced soil solution, "the concentration factor" for the former ranging from 552 to 4,967 and for the latter from 15.2 to 34.8. On the other hand, chlorides and calcium were found in considerably lower concentrations in the plant sap than in the soil solution. Nitrates were higher in some cases and lower in others in the plant sap than in the displaced soil solution. The data appeared to indicate that there may be a correlation between the concentration of phosphorus in the plant sap and that in the soil solution and soil extract.

The phosphorus concentration of the exuded sap of corn as a measure of the available phosphorus in the soil, G. G. POHLMAN and W. H. PIERRE (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 2, pp. 160-171).—The results obtained under greenhouse conditions at the West Virginia Experiment Station appear to have shown a good correlation with the response of corn to phosphate fertilization and also with the water-soluble PO_4 and the available PO_4 as determined by the Truog method (E.S.R., 64, p. 312). They are compared also with those obtained at the Rhode Island Experiment Station (E.S.R., 57, p. 812) by Gilbert and Hardin, using expressed juice. The present authors state that it is easier to collect and analyze exuded juice. The proportion of inorganic phosphate (as PO_4) is reported as varying in the corn sap examined from 62 to 602 p.p.m., the proportion usually increasing with the age of the plant.

It is further stated that "the data seem to justify additional tests with the method in order to ascertain limiting concentrations of PO_4 for normal growth. Certain factors, such as light, temperature, moisture condition of the soil, supply of other nutrients, age and metabolic condition of the plant, and height of cutting, may affect the results and these should be considered in further studies of the method.

"Although no data are presented in this paper to show the concentrations of other nutrients in the exuded sap it would appear that the method might be used to advantage in a study of the availability of various elements, particularly nitrogen and potassium."

The easily soluble phosphorus content of soil as determined by electro-dialysis, extraction with dilute acid solutions, and crop response to fertilization, H. J. HARPER (*Soil Sci.*, 35 (1933), No. 1, pp. 1-16, figs. 9).—Soils obtained from Rhode Island, New Jersey, Ohio, Indiana, Iowa, Oklahoma, and other States were studied at the Oklahoma Experiment Station with reference to the relation between the quantity of phosphorus removed from the soil by electro-dialysis or by treatment with dilute acid and the crop response of phosphatic fertilizers. Electro-dialysis removed a large percentage of the easily soluble phosphorus content of the average soil in a 3-hour extraction. It was found that the iron and aluminum phosphates were less soluble by electro-dialysis than the calcium phosphates. Apatite, triplite, and quercyte were less soluble than chlorapatite, collinsite, collophanite, and griphite. Dufrenite, wavellite, and vivianite were the least soluble of the minerals studied. The amount of the phosphorus removed by electro-dialysis correlated closely with the response of crops to phosphorus fertilization.

In most cases soils containing more than 30 p.p.m. of easily soluble phosphorus did not respond to phosphorus fertilization. Very few soils produced a

marked response from phosphorus fertilization when the easily soluble phosphorus shown by the Truog method (E.S.R., 64, p. 312) was above 20 p.p.m. The Bray method (E.S.R., 62, p. 13) for easily soluble phosphorus was not as accurate as the other quantitative methods. It was found that a lack of easily soluble iron in the soil was frequently responsible for the appearance of doubtful and medium amounts of easily soluble phosphorus by the Bray test when certain soils which give a marked response to phosphorus fertilization were analyzed. Very little iron was dissolved from soils by solutions less acid than pH 2.7.

"Climatic conditions are frequently interfering factors from the standpoint of determining response of soils to phosphorus fertilization as compared with the amount of easily soluble phosphorus present in the soil. Also soils which contain large amounts of organic matter may be rather low in easily soluble phosphorus, but little response is obtained from phosphorus fertilization, since enough of this element is obtained by the plant as a result of the mineralization of organic phosphorus by the bacteria and fungi in the soil."

The nature of phosphate fixation in soils, M. C. FORD (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 2, pp. 134-144).—This contribution from the Wisconsin Experiment Station records experiments in which soils, and certain pure minerals believed to be present in soils, were treated with soluble phosphates and later examined to ascertain the degree and nature of the fixation.

The soils were found to fix phosphorus in varying degrees in forms not easily soluble in aqueous sulfuric acid of pH 3. Goethite (limonite) fixed phosphorus in a form largely insoluble in aqueous sulfuric acid of pH 3, while hematite did not. The phosphorus fixed by bauxite was of intermediate solubility. The dehydration of goethite through heating produced hematite. A partial dehydration of bauxite increased its fixing power. Further dehydration reduced this capacity but did not entirely destroy it. The phosphates formed with goethite and partially dehydrated bauxite were found on X-ray analysis to be crystalline.

A prolonged heating of six soils at 185° destroyed fixation in relatively insoluble forms in one soil, practically destroyed it in two others, and greatly reduced it in the remaining three. "This great reduction in fixation is believed to be due chiefly to the dehydration of goethite. The failure of prolonged heating at 260° C. to reduce fixation correspondingly in some soils is believed to be due to the increased activity of bauxite brought about by heating."

The phosphorus fixed by soils as calcium or magnesium phosphates was found readily soluble in weak solvents "and thus quite available to plants"; that which was fixed as ferric and aluminum phosphates by ferric and aluminum hydroxides, chlorides, or sulfates was at least in part easily hydrolyzable and available to plants; while that which was fixed by goethite (limonite) was found very insoluble and only slowly available to plants. "The amount of goethite present in different soils is believed to vary greatly and to persist in soils when once formed, because of insufficient heat in soils to dehydrate it."

A survey of Ohio orchard soils relative to phosphorus distribution and acidity, J. H. GOURLEY and R. M. SMOCK (*Ohio Sta. Bul.* 517 (1933), pp. 22, figs. 3).—A survey of 27 Ohio orchard soils, 12 of which are here reported upon, indicated that the available phosphorus content is low in the acid soils of eastern and southern Ohio, but relatively high in the less acid soils of the northwestern portion of the State. When phosphorus was applied to sod orchards there was little, if any, percolation of available phosphorus to a depth of more than 3 in. Cultivation effected a mechanical distribution of available phosphorus to the depth of tillage.

The low pH of many of the Ohio orchard soils is considered the primary cause of failures of leguminous, or, in extreme cases, even of nonleguminous cover crops in those sections, satisfactory cover crops or other orchard covers on such soils being grown only after adequate applications of lime.

Effect of various factors on the pH of peats, M. M. McCool (*Contrib. Boyce Thompson Inst.*, 4 (1932), No. 4, pp. 497-511).—Several factors which may alter the H-ion concentration of peats were studied. The work yielded the observations, among others, that the pH values of a reed-and-sedge peat and of sedge-reed peat changed to a small extent upon widening the peat-to-water ratio; that the values for another reed-and-sedge peat, a sedimentary peat, and a silty sedimentary peat became about 1.0 greater upon high dilution; and that the changes in the reaction of the remainder of the peats induced by dilution were slight. Thirteen peats were air- and oven-dried and their pH values, with those of the moist peats, were determined after 10 minutes and after 24 hours. The change induced was in some cases slight, in others greater. Those affected to the greatest extent were the oven-dried reed-and-sedge peat, woody sedge-and-reed peat, reed-and-hypnum peat, the air- and oven-dried sedimentary peat, and the woody peat. Air-drying increased the soluble salt content of several of the peats, and oven-drying resulted in a greater concentration of the solution of each of them. There was no correlation between the pH changes induced by drying and the soluble salt content of the peats.

The H-ion concentration of the very acid peats became markedly less upon leaching with distilled water, the less acid peats changing much less in this respect. It appeared that the fine material present in the very acid peats was largely responsible for their low pH values, since upon its removal they became much less acid.

The addition of 0.1 N $\text{Ca}(\text{NO}_3)_2$ increased the H-ion concentration of the peats. Less striking changes were obtained with the addition of 0.1 N solution of KCl, KNO_3 , NH_4Cl , NH_4NO_3 , $(\text{NH}_4)_2\text{SO}_4$, and NaNO_2 . Monobasic sodium, potassium, and ammonium phosphate reacted in a similar manner with the less acid peats. The M solutions did not alter the pH values of the stronger acid peats and M/10 affected them but slightly. Large additions of commercial superphosphate (16 percent P_2O_5) and a 4-8-7 commercial fertilizer were required to alter the pH values of the peats. The addition of powdered sulfur to the moist peats lowered their pH values. The rate of change was more rapid in some than it was in others. The acid resulting from the addition of the sulfur was difficult to remove by leaching with water.

Studies on the biological decomposition of peat, R. M. SNYDER and Z. N. WYANT (*Michigan Sta. Tech. Bul.* 129 (1932), pp. 63, figs. 15).—For the purpose of a study of chemical and microbial changes, a mixture of peat, rock phosphate, and solid and liquid manure was composted in a pit for a year. During this time the citrate-soluble phosphorus increased over two and a half times (the available phosphorus in material which had been composting anaerobically for a year being increased by composting aerobically). Aerobic cellulose decomposition increased for several months, then gradually decreased. Anaerobic cellulose decomposition was active for the first six months, gradually decreasing thereafter in the upper layers, so that, at the end of the year, anaerobic cellulose decomposers could be isolated only from the bottom of the pit and in comparatively small numbers.

The count of *Azotobacter* decreased sharply during the first four weeks, then gradually, especially in the upper layers of the peat. The counts of *Azotobacter* did not increase when the peat was restored to aerobic conditions.

Bacteria forming nitrates from nitrites were present during the first two months of composting. Organisms producing nitrite from ammonia appeared to live longer but gradually died out, as did the organisms forming ammonia from urea. Warm weather caused renewed ammonification. Sulfate-reducing organisms persisted for some time, showing greater activity in the lower layers. Colon organisms maintained themselves for at least 8 months, being particularly active in the bottom of the pit.

The microbial changes induced in raw peat by composts were studied, with results described in part as follows: "A small amount of compost was found to be as effective as a small application of manure in bringing about changes in the peat, using the growing plant as an indicator. The use of clay and sulfur in such compost combinations appears to be without effect, although clay and sulfur when used together on peats low in fertility gave a response. The addition of manure to peat results in an increase in fertility so great that the manure cylinder yielded as much during the eighth and ninth years of continuous cropping as the unmanured cylinder which had been fallow prior to the eighth year. Raw peat treated with composts tends to maintain its fertility during the later years of long continued cropping. The incorporation of sand in peat increases the biological activity and the response of the crop. A small application of manure to peat when the peat is covered with a surface foot of sand brings about a favorable response of the crop growing on the sand. The biological activity in composts decreases with age. This activity is revived when new sources of energy-producing foods are added to the old composts."

Investigations on the microbiology of forest soils, D. FEHÉR (*Untersuchungen über die Mikrobiologie des Waldbodens. Berlin: Julius Springer, 1933, pp. VI+272, figs. 76*).—This monograph, covering the results of about 10 years of systematic investigation, takes up, in addition to some generalizations briefly dealt with in the introduction, methods of investigation, the bacteria of forest soils, the microbiological basis of the carbon dioxide respiration of forest soil, the microbiological investigation of the nitrogen cycle of forest soil, the changes in the average annual data concerning the biological transpositions in forest soils, the microbiological properties of sandy soils, the microscopic fungi of forest soils, investigations on the regional distribution of algae in European forest soils, the protozoa of forest soils (by L. Varga), and, in an appendix by R. Bokor, the microbiology of the "szik" (saline or alkaline) soils with reference especially to their restoration to fertility. An extensive classified bibliography is also appended.

Nitrogen fixation in some Michigan soils, L. M. TURK (*Michigan Sta. Quart. Bul., 15 (1933), No. 3, pp. 183-190, figs. 2*).—A study of six soil types indicated "that the soils of Michigan . . . contain a rather active nonsymbiotic nitrogen-fixing flora." Of the soils examined, Brookston loam showed the highest nitrogen-fixing capacity. Nitrogen fixation was greatly increased by the addition of fresh organic matter (especially legumes), lime, phosphorus, and potassium, either alone or in combination. The addition of alfalfa, especially when supplemented with lime in the case of strongly acid soils, greatly stimulated nitrogen fixation in the soils studied.

"Possible practical applications for the foregoing results emphasize the necessity for consideration of the nitrogen-fixing organism in a good system of soil management. The results secured also emphasize the need of a more thorough study of the importance of nonsymbiotic nitrogen fixation in field soils in Michigan."

The story of Field A of the Massachusetts Agricultural Experiment Station: A review of experiments with nitrogen fertilizers, F. W. MORSE

(*Massachusetts Sta. Bul.* 290 (1932), pp. 23, fig. 1).—The bulletin records some of the main results of 50 years' work on a field laid out on exhausted hay land in 1883 and kept under continuous plot experiment since that date.

The early corn crops indicated that this "run out" hay land contained nitrogen which had been accumulated without nitrogen fertilizers. Following four successive years of clover and grass, the plots without nitrogen fertilizers led all others in their average yields of corn and stover in 1911, and in the last year of the experiment clover hay was heaviest on these plots. Nitrogen fertilizers were most effective when a tilled crop followed a tilled crop.

Judged by crop yields, sodium nitrate was usually most effective, ammonium sulfate requiring calcium carbonate in the soil for the best effect. When recently limed, the ammonium sulfate plots were virtually equal to the sodium nitrate plots. Farm manure, supplemented with phosphate and potassium compounds, excelled several times with crops which made their growth in summer. Organic nitrogen was superior in three seasons. Other results are also recorded and analyzed.

A general conclusion drawn from the study of the voluminous data accumulated from this long period field work is, in part, that "field experiments should be planned primarily to afford the investigator an opportunity to test under practical conditions, on a small inexpensive scale, those theories, principles, and processes which have been developed under controlled conditions in the laboratory and vegetation house. To depend upon such experiments to furnish the information and data upon which practices and theories may be based and developed is not justified and is sure to prove disappointing. Where such work has been continued for a long period of years without change, it has resulted in the accumulation of a large mass of records which could not be interpreted in terms of much agronomic value. An intelligent program requires variation in the details of treatment and management in conformity with the changes in economic conditions" affecting the work.

Commercial fertilizers and soil acidity, A. W. BLAIR (*New Jersey Stas. Circ.* 266 (1933), pp. 3).—The potential acidifying effects of ammonium sulfate and of some other ammonium salts and mixtures containing them are noted, together with the proportionate quantities of calcium carbonate or of hydrated lime required to neutralize the acidity set free in the utilization of these ammonium compounds; and the relative values, from the viewpoint of the counteracting of acidity thus produced, of such fertilizer materials as calcium cyanamide, sodium nitrate, calcium nitrate, basic slag, wood ashes, rock phosphate, farm manure, etc., are briefly discussed.

Analyses of commercial fertilizers, H. E. CURTIS, H. R. ALLEN, and L. GAULT (*Kentucky Sta. Bul.* 325 (1931), pp. 477-583).—The bulletin covers, for 1931, the usual analyses and related information.

Analyses of commercial fertilizers and ground bone; analyses of agricultural lime, 1932, C. S. CATHCART (*New Jersey Stas. Bul.* 551 (1933), pp. 19).—Continuing the data largely recorded in Bulletin 549 (E.S.R., 68, p. 599), the present bulletin contains "the remaining analyses together with a discussion of the whole inspection."

Inspection of fertilizers, W. L. ADAMS and A. S. KNOWLES, JR. (*Rhode Island Sta. Ann. Fert. Circ.*, 1932, pp. 17).—Of the largest number of samples ever collected in the State, 95 percent met guaranties fully, and but 2 percent showed deficiency equaling or exceeding 0.3 percent. The number of brands offering 20 percent or more of plant food was more than double that of the previous year, and several brands carried from 40 to 50 percent.

Inspection of agricultural lime products, H. D. HASKINS (*Massachusetts Sta. Control Ser. Bul. 66* (1932), pp. 8).—In 36 liming materials the analyses recorded showed but one serious deficiency, and in the gypsum products, no deficiencies.

AGRICULTURAL BOTANY

Plant physiological chemistry, R. B. HARVEY (*New York and London: Century Co., 1930, pp. XIX+413, figs. 119*).—"It is the purpose of this text to present the physiological chemical mechanism of the vital processes of plants. Most attention will be given to the metabolic reactions, with some of the chemistry underlying the process, but complete description of the chemical compounds of plants does not lie within the province of this text. . . . Free use has been made of every source of information. . . . No great amount of new research data is presented here, but the material which has been used for illustration is of a nature such as should give a new point of view to students of plant physiology and of the plant sciences in general. The main part of the discussion is devoted to the synthesis, translocation, storage, digestion, and utilization of substances within the plant. The viewpoint is mainly physiological, but the interpretation necessarily involves chemistry and physics. It is assumed that the student has some knowledge of chemistry and physics as well as of general botany and plant physiology."

[Plant physiology studies of the New York Cornell Station] (*New York Cornell Sta. Rpt. 1932, pp. 111, 112*).—Data are briefly reported as to studies on the direct utilization of leucine, glycerine, and aspartic acid by orchid embryos and the nonsymbiotic germination of *Calluna vulgaris*, both by L. Knudson; the catalyzing action of manganese on iron and the necessity of iron for the growth of *Lemna minor*, by E. F. Hopkins; the relation of manganese to plant growth, by A. Saeger; and the influence of X-rays on plants, by Knudson.

Absorption of water by aerial parts of plants [trans. title], N. ZAMFIRESCU (*Bul. Min. Agr. și Domen. [Rumania], 3* (1931), No. 5-6, Sup., pp. 105, figs. 49; *Fr. abs., pp. 101-105*).—Plants can secure in part the water they require via their aerial parts, especially the leaves, the anatomical structure of which is favorable to its entrance. Absorption is considered an appropriate technical name for this process in plants.

The effect of drought on the osmotic value of plant tissues, W. A. BECK (*Protoplasma, 8* (1929), No. 1, pp. 70-126).—The effect of drought on the osmotic value at incipient plasmolysis (O_g) was studied in 14 experiments using various tissues of the leaf of *Hedera helix*. It is claimed that the data collected are so arranged that the effect of drought and the accompanying factors can readily be detected for the different tissues. The epidermal tissues were very irregular in their response, which is held to indicate that the influence of the accompanying factors easily predominates over the influence of drought. Temperature seemed particularly effective, low temperature increasing the O_g , and, within limits, high temperature decreasing it under drought conditions.

The influence of a nutritive medium previously used for *Ophiobolus miyabeanus* when afterward so used for another fungus [trans. title], S. SATOH (*Mem. Col. Agr., Kyoto Imp. Univ., No. 13* (1931), pp. 41-54, figs. 2).—In the liquid culture used for development of *O. miyabeanus* two kinds of material were formed, one of which favored and the other hindered the growth of *Aspergillus niger*. Particulars regarding these are given.

Hydrogen-ion phenomena in plants, I—III, J. I. ARMSTRONG (*Protoplasma*, 8 (1929), Nos. 2, pp. 222–260, figs. 7; 3, pp. 313–343, figs. 2; 4, pp. 508–521).—The three sections of this account respectively report on hydrion concentration and buffers in the fungi, an investigation of the buffer complex of sap from stems of *Pelargonium* sp., and the acidity of certain cell walls considered in relation to the higher fatty acids.

Observations on the effect of pH value on oxidase activity, W. V. CRUESS, R. N. JEFFREY, and H. M. PANCOAST (*Amer. Jour. Bot.*, 19 (1932), No. 10, p. 841).—In this study at the University of California it was found that oxidase activity, as measured by the rate of absorption of oxygen by the expressed juices of peach, apricot, olive, apple, avocado, asparagus, and spinach, was greatly affected by pH values, the absorption of oxygen practically ceasing at values below 2.5. Above pH 4 absorption was more rapid than below this point. Citric acid and sodium hydroxide were used to modify pH.

Catalase activity and respiration in the leaves of growing barley, M. N. POPE (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 1, pp. 35–40, fig. 1).—The rate of respiration in leaves of Hannchen barley was found to be inversely proportional to the stage of maturity. Catalase activity varied directly with the age of the leaf until full maturity, when it decreased rapidly with the decrease in the amount of living material in the tissues. Respiration rate and catalase activity in homologous younger leaves of comparable barley plants were correlated negatively, while in older leaves relationships were indefinite. The negative correlation found between respiration and catalase activity is contrary to results of others, but it is deemed probable that any correlation is fortuitous. Current methods of determination probably can measure total catalase activity only if it is a by-product of metabolism or has a function other than the breaking down of hydrogen peroxide.

Dwarf plants from unafter-ripened embryos of seeds of *Rhodotypos kerrioides*, F. FLEMION (*Amer. Jour. Bot.*, 19 (1932), No. 10, pp. 837, 838).—When excised embryos were mixed with moist peat moss at 25° C. a small percentage of seedlings were obtained, despite the absence of previous after-ripening at low temperature. The resulting plants grew very slowly, and in fact were essentially dwarfs until some 4 to 7 months later, when normal growth began.

The possibility of senility resulting from long-continued vegetative reproduction [trans. title], A. P. C. BIJHOUWER (*Lab. Tuinbouwplantent., Wageningen, [Meded.]* 12 (1930), pp. 119, figs. 5, Eng. abs. pp. 95–103; also in *Meded. Landbouwhooges. Wageningen*, 34 (1930), No. 4, pp. 119, figs. 5, Eng. abs. pp. 95–103).—In this paper senility, especially in the higher plants, is discussed.

“At present all the ‘symptoms of senility’ are known to be caused by infectious diseases, among which virus diseases are prominent.” Both discussion and experimentation, it is claimed, have failed to solve the question as to the occurrence of senility. They have, moreover, raised new questions. Criticism is offered as to the methods reported, as also to the lack of adequate application of the mathematical method. “It is thus rendered quite open to question whether in working with clone material any attention need be paid to the theory of senility.”

The formative effect of day length on wheat seedlings, A. M. HURD-KARRER (*Jour. Md. Acad. Sci.*, 1 (1930), No. 2, pp. 115–126, figs. 5).—The experimentation herein described is claimed to have proved the importance of a short day to the initiation of the rosette growth in fall-sown winter wheat plants, and to have evidenced the relationship of this factor with temperature

and with some soil condition, supposedly moisture. This resting period, if not essential, is at least conducive to the subsequent normal growth and maturation of the wheat plants.

Cultivation of plants in artificial light [trans. title], J. W. M. ROODENBURG (*Lab. Tuinbouwplantent., Wageningen, [Meded.] 14 (1930), pp. 68, figs. 22, Eng. abs. pp. 62-66; also in Meded. Landbouwhoogesch. Wageningen, 34 (1930), No. 8, pp. 68, figs. 22, Eng. abs. pp. 62-66*).—In the autumn of 1928 a start was made upon a thorough study of the possibilities inherent in the cultivation of plants in artificial light. To the incandescent lamps at first used were later added the neon tube light and the mercury vapor tube light. The features, uses, and values of these are dealt with in detail, and their applicability to work with plants as supplementary to or in substitution for sunlight is discussed in connection with sweet pea seedlings, strawberries, or lilies-of-the-valley.

It is claimed that such preliminary experimentation has proved the possibility of using artificial light economically in the cultivation of plants during winter, though the most economical methods are yet to be developed. "The best source we have to our disposal is neon light so far." Practical considerations are outlined.

Shifting of the periodicity: Adaptation and export to the Southern Hemisphere (hyacinth and tulip) [trans. title], A. H. BLAAUW, I. LUYTEN, and A. M. HARTSEMA (*Lab. Plantenphysiol. Onderzoek, Wageningen, Meded. 28 (1930), pp. 105, pls. 2, figs. 8; Eng. abs., pp. 87-105*).—Since 1922 the authors have experimented with hyacinths and tulips endeavoring to shift the blooming by six months and to test in the Netherlands and later in the Southern Hemisphere the plants so dealt with. They outline their conclusions from both a botanical and a practical standpoint.

It appears that for the inhibition of buds on a plant, and thus for a shifting of its periodicity, the thing of principal significance is the point of time at which the inhibition (influenced largely by temperature) begins, consequently the state in which the buds are at that time. For hyacinth and tulip this inhibition should take place when the leaflets of the buds are as nearly as possible in the embryonic state, as the more these organs are developed the more difficult to arrest their growth and the lower the temperatures required for this purpose. This becomes evident later when after development some leaves are seen to be abnormally shorter and narrower, or even lacking entirely in development. The work, its results, and conclusions therefrom are set forth with detailed analytic discussion.

A method for determining the specificity of the intracellular globulin of *Fusarium lini*, C. I. NELSON (*Jour. Agr. Res. [U.S.], 46 (1933), No. 2, pp. 183-187*).—By using a method described in this contribution from the North Dakota Experiment Station, specific antigenic protein material may be obtained from mycelial masses of *F. lini*. A fraction corresponding to globulin possesses antigenic specificity in a higher degree than prepared mycelial masses. Globulins thus obtained from *F. lini* and purified by electrodialysis were used as antigens to produce antisera in rabbits. By a special microtechnic, the specificity of these antiglobulin sera was checked against homologous and heterologous antigens. The serological tests indicated that the globulin obtained from the mycelial masses of *F. lini* was a reactive and specific antigen.

[Fungi in relation to stored hay and corncobs] (*Iowa Sta. Rpt. 1932, p. 40*).—Data are reported by A. L. Bakke and E. R. Henson on the relation of *Rhizopus tritici* and *Aspergillus flavus* to thermogenesis in stored hay and

by J. C. Gilman on *A. flavus*, *A. terreus*, *Penicillium oxalicum*, and *R. tritici* to the decomposition of corn cob meal.

Tropical and subtropical agricultural plants of the world: Their history, culture, and significance for political economy.—I, Starch and sugar plants, A. SPRECHER VON BERNEGG (*Tropische und Subtropische Weltwirtschaftspflanzen: Ihre Geschichte, Kultur und Volkswirtschaftliche Bedeutung.*—I. Teil, Stärke- und Zuckerpflanzen. Stuttgart: Ferdinand Enke, 1929, vol. 1, pp. XV+438, pls. 3, figs. 130).—This deals, in its several sections, with rice (*Oryza sativa*), maize (*Zea mays*), sorghum (*Sorghum vulgare*), manioc (*Manihot utilissima*), sweetpotato (*Ipomoea batatas*), yam (*Dioscorea* sp.), taro (*Colocasia antiquorum*), arrowroot (*Maranta arundinacea*), Indian cane (*Canna* sp.), turmeric (*Curcuma* sp.), pia or Tahiti arrowroot (*Tacca pinnatifida*), Japanese arrowroot (*Pachyrhizus angulatus*), vegetable pear or chayote (*Sechium edule*), sago palm (*Metroxylon* sp.), sugarcane (*Saccharum officinarum*), and sugar palm (*Arenga saccharifera*).

The identification of the more important prairie hay grasses of Nebraska by their vegetative characters, F. D. KEIM, G. W. BEADLE, and A. L. FROLIK (*Nebraska Sta. Res. Bul.* 65 (1932), pp. 40, figs. 36).—An analytical key, based on vegetative characters, is presented as a guide in the identification of 27 grass species contributing appreciably to the prairie hay crop of Nebraska. The key is supplemented by illustrations and descriptions of the most important characters and merits of these grasses.

GENETICS

Genetic mutations produced by electro-magnetic induction and X-rays, A. PIROVANO ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Sci. and Pract.* [Roma], 23 (1932), No. 9, pp. 330–338, figs. 5).—Following a discussion of the principles involved and a description of the apparatus employed, the author reports the results of experiments at the Fruit Growing and Electrogenetic Institute of Roma with a constant breeding strain of *Cucurbita pepo*. The pollen used was taken from male flowers subjected to electromagnetic oscillations the evening before opening. The fruits resulting from pistillate flowers fertilized with treated pollen varied markedly in form and color, and the seeds were considerably smaller than those of normal fruits. Mutations obtained have remained constant through nine succeeding generations. Work with vinifera grapes yielded mutations remarkable for the abundance of suckers and flowers. Two of these grapes, named Galvani and Volta, were very desirable on account of earliness.

Bud mutation in horticultural plants [trans. title], V. CARRANTE (*Italia Agr.*, 69 (1932), No. 10, pp. 350–370, figs. 10).—This is a general discussion of the subject, supported by illustrations and descriptions of fruit mutations in the orange and lemon and by references to other mutations in the almond, walnut, grape, and potato.

A dominant mutation of frequent recurrence in sorghum, R. E. KAPER (*Amer. Nat.*, 66 (1932), No. 707, pp. 511–529, fig. 1).—A dominant tall mutant, recurring frequently among a number of pure lines of Standard Blackhull kafir continuously inbred for a prolonged period at the Texas Experiment Station, was found to differ from normal by a single gene, and seemed to be the result of frequent gene mutation, likely taking place during gametogenesis of the parental plant. Economically, the new type is considered superior from the viewpoint of forage and silage, although inferior as to convenience in harvesting for grain.

The genetics of a thread-leaved tomato mutant [trans. title], E. SCHIEMANN (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 63 (1932), No. 1-2, pp. 43-93, figs. 34).—Arising as a variation of the commercial variety Comet, this thread-leaved mutant was found at the Berlin-Dahlem Botanical Museum to hybridize with normal forms on a monofactorial basis. Four characteristics, namely, drooping habit, thread-shaped leaves, choripetalous blooms, and weak growth, were apparently controlled by a single factor. The number of chromosomes (12 haploid) was unchanged, and the reduction divisions progressed normally.

Mutant types of the dwarf banana, E. E. CHEESMAN (*Trop. Agr. [Trinidad]*, 10 (1933), No. 1, pp. 4, 5, figs. 2).—Instances of presumable sporting in the ordinary dwarf banana are cited in support of the hypothesis that varieties such as the Congo, with naked rachises, were derived from *Musa cavendishi*.

Xenia and metaxenia in apples, II, B. R. NEBEL and I. J. TRUMP (*Natl. Acad. Sci. Proc.*, 18 (1932), No. 5, pp. 356-359).—In this second contribution (E.S.R., 64, p. 819) from the New York State Experiment Station, the authors report that McIntosh apples fertilized, respectively, with Red Astrachan and Yellow Bellflower pollen differed essentially. Where Red Astrachan was used as the pollen parent the fruits were significantly heavier, the pH values were significantly lower and less variable, and seed length was significantly less. Determinations of acidity by titration also showed that apples of Red Astrachan parentage were the more acid. In outward appearance the Red Astrachan group was obviously superior.

Linkage relations of a second brown midrib gene (bm_2) in maize, C. R. BURNHAM and R. A. BRINK (*Jour. Amer. Soc. Agron.*, 24 (1932), No. 12, pp. 960-963, fig. 1).—A second brown midrib character (bm_2), genetically distinct from although resembling the brown midrib (bm_1) described by Eyster (E.S.R., 56, p. 328) and Jorgenson (E.S.R., 66, p. 727), was found to be inherited as a simple recessive in studies by the Wisconsin Experiment Station and the California Institute of Technology. The gene appeared to be located in the *P-br* group, the probable order of the factors tested being *P-br-f-an-gs-bm_2*. Its location in this chromosome at a point remote from *P* and *f* greatly extended the map of the group.

The effect of a lethal in the heterozygous condition on barley development, D. W. ROBERTSON (*Colorado Sta. Tech. Bul.* 1 (1932), pp. 12, fig. 1).—Single lethals studied in four barley varieties included the white seedling factor Single lethals studied in four barley varieties included the white seedling factor pairs $A_c a_c$ in Colsess and $A_h a_h$ in Hanna, a yellow seedling factor pair $X_b x_b$ in Black Hull-less, and the white seedling factor pair $A_{12} a_{12}$ in Canada Thorpe, which also affected the endosperm. Comparison of measurements of the homozygous green plants with those of the heterozygous plants revealed no significant differences in number of culms per plant, average length of culm, average length of head, number of grains per plant, and total weight of grain per plant. When the lethal seedling factor pair was associated with an endosperm deficiency, there was a significant difference in total grain weight per plant. The results indicated that there is no detrimental effect of a single seedling lethal factor in the heterozygous condition in the development of the barley plant.

The inheritance of characters in ragi, *Eleusina coracana* (Gaertn.).—**Part VI, Earhead shapes**, G. N. R. AYYANGAR, P. K. RAO, and U. A. WARIAR (*Indian Jour. Agr. Sci.*, 2 (1932), No. 3, pp. 254-265, pls. 3).—Panicle shape in ragi, according to the sixth contribution in this series (E.S.R., 67, p. 25), may be grouped broadly as curved, in which the digitate spikes of the inflorescence curve in, and opens, in which they are open. A factor for density *Q*, responsible for a close assembly of spikelets on the rachis, is present in the curved and

absent in the opens. Curveds may be separated further into in-curveds, of which the spikes curve in, and top-curveds, longer than the in-curveds, in which only the tops curve. A second factor *E* determines the elongation of the rachis and separates the top-curveds and the in-curveds. *E* is also present in the opens, and its presence or absence gives rise to the groups long-opens and short-opens, which are separated with difficulty, although they could easily be demonstrated from segregates with top-curveds and in-curveds, respectively. *Q* and *E* are independent of factors for plant purple pigmentation.

Inheritance of dwarfing in wheat, D. C. TINGEY (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 1, pp. 74-94, figs. 10).—A genetic study of dwarfing in wheat (E.S.R., 67, p. 663) secured from 15 crosses and from observations on the occurrence of dwarfing in 77 others is reported on from the Utah Experiment Station. Results obtained on the studies of the F_2 and F_3 generations of tall \times tall, tall \times dwarf, and intervarietal crosses were explained on a two-factor basis, i. e., a dominant dwarfing factor *DD* and an inhibiting factor *II*. Besides the two genetic types, *DDII* and *ddii*, there were varieties of the *ddII* type. A tentative genetic classification in respect to dwarfing is presented for varieties and strains used in the crosses.

Some observations on the characters of wild rice hybrids, S. K. MITRA and P. M. GANGULI (*Indian Jour. Agr. Sci.*, 2 (1932), No. 3, pp. 271-279, pl. 1).—In a cross between Latisail, a cultivated rice, and wild rice (*Oryza sativa fatua*), the F_1 resembled the wild parent yet showed marked heterosis. The color of the leaf sheath, pulvinus, ligule, leaf margin, and internode of the apiculus and stigma, and of the node, and the spreading v. erect growth habit were monofactorial in inheritance, while two complementary factors appeared to be involved in the color of auricle, of outer and inner (floral) glumes, of inner (mature) glumes, and of kernel, and panicle habit, and awn length. See also an earlier note on color inheritance in rice (E.S.R., 59, p. 219).

Pollen abortion in species hybrids, D. KOSTOFF (*Cytologia*, 3 (1932), No. 4, pp. 337-339, figs. 4).—The abortion of a high percentage of the pollen in *Secale* spp. hybrids, involving *S. cereale* and *S. montanum*, and also in *Nicotiana* spp. hybrids, appeared due to the retardation of the meiotic processes and the nuclear division in the pollen, whether or not the pollen had a complete haploid set of chromosomes. Such retardation of the meiotic processes seemed to be due to abnormal biophysical and biochemical processes created by the hybridization, e. g., the increase of the cytoplasmic viscosity in certain *Nicotiana* spp. hybrids.

Some results of inbreeding grade Guernsey and grade Holstein-Friesian cattle, T. E. WOODWARD and R. R. GRAVES (*U.S. Dept. Agr., Tech. Bul.* 339 (1933), pp. 32, pls. 6).—Grade dairy cows were mated with Guernsey and Holstein bulls and the daughters mated back to their sire in the test with Guernseys. This was repeated for successive generations in the experiment with Holsteins, using sons and grandsons of the original sire.

After making suitable corrections for live weights and milk and butterfat production to bring the data to a comparable basis, it was found that the inbreeding reduced birth weights and mature weights of both Guernseys and Holsteins. Inbreeding also lowered the vigor of the calves as measured by the mortality after birth and rate of growth.

The number of services required for conception and the number of abortions were unchanged in successive generations of inbreeding in the Holstein herd, but it was necessary to close out the study with the Guernseys after two generations on account of an outbreak of infectious abortion.

The milk and butterfat production was increased and the fat percentage lowered as the concentration of Holstein blood increased.

A recessive lethal factor appeared when the Guernsey sire was mated to his daughters.

Twinning, sex ratios, and genetic variability in birth weight in sheep, A. B. CHAPMAN and J. L. LUSH (*Jour. Heredity*, 23 (1932), No. 11, pp. 473-478).—In the grade Hampshire flock of the Iowa Experiment Station there were 1,019 lambs born from 1915 to 1930, of which 722 were twins. The proportion of the sexes was 48.4 percent of males to 51.6 percent of females. A study was also made of the variance in the birth weights of the twin lambs grouped according to sex, litter, and year of birth, from which it is concluded that no more than from 25 to 30 percent of the variance in birth weight was genetic, about 30 to 35 percent was caused by tangible environment, and about 40 to 45 percent arose from intangible environment or accidents of development, including intrauterine competition.

Nine independently inherited autosomal factors in the domestic fowl, D. C. WARREN (*Genetics*, 18 (1933), No. 1, pp. 68-81, fig. 1).—The results are given of studies at the Kansas Experiment Station of matings between domestic fowls exhibiting nine autosomal characters, of which the dominant members of the allelomorphic pairs were naked neck, rumpless, white skin, leg-feathering, rose comb, pea comb, crest, polydactyly, and dominant white. The lack of linkage relations may be observed in the following table, which gives the numbers produced in back-crosses of double heterozygous parents to double recessives:

Offspring produced in back-cross tests for linkage, the first number being the non-cross-overs and the second the cross-overs

Factor	Domi- nant white	Poly- dactyly	Crest	Pea comb	Rose comb	Leg- feather- ing	White skin	Rump- less
Naked neck.....	304-308	187-239	125-107	664-721	348-374	656-679	398-430	890-827
Rumpless.....	194-193	199-181	112-122	165-186	353-369	280-292	250-236	-----
White skin.....	161-148	112-110	107-115	120-123	163-155	217-248	-----	-----
Leg-feathering.....	157-137	199-182	115-119	727-697	325-310	-----	-----	-----
Rose comb.....	194-183	148-146	80- 92	388-506	-----	-----	-----	-----
Pea comb.....	285-262	152-160	177-173	-----	-----	-----	-----	-----
Crest.....	-----	121-113	-----	-----	-----	-----	-----	-----
Polydactyly.....	161-149	-----	-----	-----	-----	-----	-----	-----

¹ From a paper by A. S. Serebrovskii and S. G. Petrov. Zhur. Eksper. Biol. (Jour. Biol. Expt.), 6 (1930), No. 3, pp. 157-180.

Flightless—A heritable variation in the domestic fowl, D. C. WARREN (*Jour. Heredity*, 23 (1932), No. 11, pp. 449-452, figs. 3).—A study of the inheritance of the flightless character in fowls, in which the large feathers of the wings and tail break off, is reported from the Kansas Experiment Station. In matings of a male showing this characteristic with normal females 129 flightless and 136 normals were produced, indicating that the character is dominant and the flightless male is heterozygous. Other matings of the flightless daughters confirmed this hypothesis. There were no indications of sex differences or interference with the viability of flightless birds.

Genetics of the fowl.—II, A four-gene autosomal linkage group, F. B. HURR (*Genetics*, 18 (1933), No. 1, pp. 82-94).—Continuing this series at the Minnesota Experiment Station (E.S.R., 63, p. 818), back-cross matings of double heterozygous frizzled dominant white birds to the double recessives showed about 18 percent crossing over. There were 157 offspring produced in the repulsion phase and 168 in the coupling phase. With the establishment of linkage between the frizzling and dominant white genes it follows that the

four genes for dominant white, frizzling, crest, and cerebral hernia are located in the same chromosome. The suggested order is dominant white 10 cross-over units from cerebral hernia, which is separated by 8 units from frizzling, with crest 28 units distant and nearer the opposite end of the chromosome. The genes for rose comb and white shanks were not located in this group as they were inherited independently of frizzling and dominant white. Fourteen autosomal characters not located with the dominant white, frizzling, crest, and cerebral hernia group are listed, together with evidence of their independent inheritance.

The relation of sex to crossing over in the fowl is also discussed.

Factors affecting the breeding of the field mouse (*Microtus agrestis*).—I, Light, J. R. BAKER, and R. M. RANSON (*Roy. Soc. [London], Proc., Ser. B*, 110 (1932), No. B 767, pp. 313-322, fig. 1).—In studying the influence of light on reproduction in the field mouse, it was found that by reducing the daily exposure to electric light from 15 to 9 hours the number of pregnancies was reduced from 24 for an average of 7.5 control females to 4 for an average of 7.8 females exposed to 9 hours of light daily. Studies of the genital organs of the males indicated that they were fertile, but that the females were more likely to be affected by reduced light.

Occurrence of polydactyly and its mode of inheritance in the domestic guinea pig [trans. title], A. PICTET (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 63 (1932), No. 1-2, pp. 1-42, figs. 5).—In matings of normal individuals from a polydactylous line there were produced 135 normals and 9 individuals showing various grades of polydactyly, a ratio of 15:1. The ratios obtained by continued breeding through eight generations led to a setting up of a 3-factor hypothesis to explain the inheritance of polydactyly. The polydactylous animals were homozygous dominants for the conditional factor *P* and heterozygous for the intensity factors *E* and *N*, each of which was contributed by different normal parents. Differences in the degree of completeness of formation of the extra digit seemed to be related to the intensity factors, but polydactyly was independent of sex and was not lethal.

The genetic basis of alkaptonuria, L. HOGBEN, R. L. WORRALL, and I. ZIEVE (*Roy. Soc. Edinb. Proc.*, 52 (1931-32), No. 3, pp. 264-295, pls. 6).—The authors state that an analysis of the cases of alkaptonuria reported in the literature indicates that the disease is hereditary and due to a recessive autosomal gene, although a dominant type was also observed.

Studies in human inheritance.—VI, A genetic refutation of the principles of "behavioristic" psychology, D. C. RIFE and L. H. SNYDER (*Human Biol.*, 3 (1931), No. 4, pp. 547-559, figs. 8).—In continuing this series (*E.S.R.*, 66, p. 523) a study was made of the pedigrees of inmates of various institutions showing special ability. It is pointed out that special musical, mechanical, mathematical, and artistic ability may develop even in the presence of feeble-mindedness. This indicates that training and instruction which frequently fail to bring out special ability do not play a very important part in expression of special ability.

A genetical formula for the inheritance of intelligence in man, C. C. HURST (*Roy. Soc. [London], Proc., Ser. B*, 112 (1932), No. B 775, pp. 80-97).—The inheritance of intelligence in man is suggested as being due to the operation of a major gene *N* for normal intelligence and five modifying genes, based on a study of the intelligence of 388 parents and 812 offspring in Leicestershire families and 424 parents and 558 offspring in royal families of the principal European countries.

Filial and fraternal correlations in sex-linked inheritance, L. HOGBEN (*Roy. Soc. Edinb. Proc.*, 52 (1931-32), No. 3, pp. 331-336).—The theoretical cor-

relations between parent and offspring and brothers and sisters with and without dominance of autosomal and sex-linked characters are presented as follows:

Filial and fraternal correlation coefficients for autosomal and sex-linked characters

Relationship	Dominance complete		Heterozygote intermediate	
	Autosomal	Sex-linked	Autosomal	Sex-linked
Father-son.....	0.33	0.00	0.50	0.00
Mother-daughter.....	.33	.33	.50	.50
Father-daughter.....	.33	.58	.50	.71
Mother-son.....	.33	.58	.50	.71
Brother-brother.....	.42	.50	.50	.50
Brother-sister.....	.42	.29	.50	.35
Sister-sister.....	.42	.67	.50	.75

The correlation of relatives on the supposition of sex-linked transmission, L. HOGBEN (*Jour. Genetics*, 26 (1932), No. 3, pp. 417-432).—In addition to the correlations noted above, the theoretical avuncular, grandparental, and cousin correlations in case of sex-linked inheritance are presented. The high correlation of 0.375 for male pairs of maternal first cousins seems most significant for detecting the contribution of sex-linked genes.

Self-sterility and cross-sterility in plants and animals, F. BRIEGER (*Selbststerilität und Kreuzungssterilität im Pflanzenreich und Tierreich. Berlin: Julius Springer, 1930, pp. XI+395, figs. 118*).—This volume deals in systematic and analytic detail with parasterility in higher plants, parasterility in Metazoa, and parasterility in Thallophyta and Protista, with a concluding section considering adaptation and sexuality. An extensive literature list and a name and subject index complete the small but compact volume.

The physiological and genetical aspects of sterility in domesticated animals, W. ORR and F. F. DARLING (*Edinburgh: Imp. Bur. Anim. Genet., 1932, pp. 80*).—Various pathological conditions responsible for sterility are described as well as nutritional influences on normal reproduction. Under the relation of genetic factors to sterility there are discussed hereditary abnormalities of the reproductive system and lethal factors. An extensive bibliography, by M. V. Cytovich, is included.

The gonadotropic hormones (ρ -factors), I, II (*Quart. Jour. Expt. Physiol., 21 (1931), No. 2, pp. 147-179, fig. 1; 21 (1932), No. 4, pp. 315-318*).—Two parts are here presented.

I. *The preparation and properties of extracts of anterior lobe, placenta, and pregnancy urine*, B. P. Wiesner and P. G. Marshall.—The results are reported of tests of the potency of extracts of the anterior lobe of ox pituitary, human placenta, and pregnancy urine in inducing ovulation in immature mice. Several methods were found for preparing active extracts of the anterior lobe of the pituitary and the placenta, but phosphotungstic acid and alcohol precipitation were most successful for purifying the prolan from pregnancy urine. Large doses of prolan inhibited oestrus, while small doses induced ovulation. The possibility of two factors being present in prolan is discussed.

II. *Selective filtration experiments*, P. G. Marshall.—An attempt was made to get some indication of the molecular size of the gonadotropic hormones of the anterior lobe of the hypophysis and the placenta by passage of extracts

through different sized filters. Extracts free of protein were found reduced in potency when passed through the filters in which the pores were $3\ \mu$ or less in diameter. The molecular weight between that of Congo red and benzo-purpurin, about 800-900, was suggested for the ρ -factors.

Further studies on estrin-hypophyseal antagonism in the white rat, J. SPENCER, F. E. D'AMOUR, and R. G. GUSTAVSON (*Endocrinology*, 16 (1932), No. 6, pp. 647-654, figs. 4).—In studying the possibility of overcoming the inhibitory effect on growth of continued oestrin injections, 3 lots of 20 3- to 4-weeks-old rats each received daily injections as follows: (1) Ten rat units of oestrin, (2) the same amount of oestrin and an extract of pregnancy urine, (3) the same amount of oestrin and the growth hormone of the hypophysis, with a fourth lot of controls receiving no injections. Pregnancy urine had no influence on the growth of the oestrin-injected animals. The growth of those receiving oestrin and the growth hormone of the hypophysis was increased practically equal to the controls, but the growth of the long bones was not as great. The extract of pregnancy urine improved the weight and development of the gonads in oestrin-injected rats. The inhibition of growth and gonadal development as a result of long-continued oestrin administration seemed to be due to an inhibition of the hypophysis.

The influence of oestrin on the gonad-stimulating complex of the anterior pituitary of castrated male and female rats, R. K. MEYER, S. L. LEONARD, F. L. HISAW, and S. J. MARTIN (*Endocrinology*, 16 (1932), No. 6, pp. 655-665).—As the ovaries of immature rats receiving implants of hypophyses from castrated male and female rats previously injected with oestrin weighed, respectively, 45 and 47 percent less than the ovaries of immature rats receiving implants of hypophyses from noninjected castrated males and females, it is concluded that oestrin decreases the amount of gonad-stimulating complex in the hypophyses of castrated male and female rats.

Studies on the hypophysectomised ferret, I-III, M. HILL and A. S. PARKES (*Roy. Soc. [London], Proc., Ser. B*, 112 (1932), No. B 775, pp. 138-158, pls. 3, figs. 4).—Three papers in this series are reported.

I. *Technique* (pp. 138-145).—The first paper describes the operation for the removal of the hypophysis in the ferret.

II. *Spermatogenesis* (pp. 146-152).—The influence of the hypophysis on spermatogenesis was determined by studying the testes following hypophysectomy in five ferrets. After 30 days the weight of the testes was reduced to less than half, and the epididymis was reduced as compared with the normal. The spermatid tubules showed progressive atrophy, and primary spermatocytes were the last stage of spermatogenesis detectable. Although the epididymis assumed the quiescent state of anoestrus a few spermatozoa were present in the epididymis 30 days after the removal of the hypophysis.

III. *Effect of post-coitus hypophysectomy on ovulation and the development of the corpus luteum* (pp. 153-158).—Removal of the hypophysis 1 hour 50 minutes or longer after the beginning of coitus, which was as soon as the operation could be performed, did not prevent ovulation in five female ferrets. None of the animals showed any signs of pregnancy at autopsy performed up to 28 days after copulation, and corpora lutea did not develop normally. It appears that the ovulation-producing hormone is secreted into the circulation in less than 2 hours after copulation.

Modification of mammalian sexual cycles; reactions of ferrets (*Putorius vulgaris*) of both sexes to electric light added after dark in November and December, T. H. BISSONNETTE (*Roy. Soc. [London], Proc., Ser. B*, 110 (1932), No. B 767, pp. 322-336, pl. 1).—Three female ferrets came in heat and copu-

lated between October 12 and January 5, which is in the normal anoestrous period. This abnormal condition was in response to exposure from 6 to 6.5 hours of additional electric light each day. Spermatogenesis and other indications of the breeding season were also stimulated in males, but no mature sperms were produced even with 71 days of the light treatment. The results are based on observations of the males and females and their behavior, and microscopical studies of the testes of the males.

The reproductive processes of certain mammals.—III, The reproductive cycle of the male ferret, M. ALLANSON (*Roy. Soc. [London], Proc., Ser. B*, 110 (1932), No. B 767, pp. 295–312, pls. 3, figs. 7).—Continuing this series (*E.S.R.*, 67, p. 121) observations are reported on the weights and character of the testis, epididymis, vas deferens, and penis of 16 adult and 3 immature ferrets, killed at different times of the year. These organs showed much greater development during the active breeding season from March to July than at the more or less quiescent period during the balance of the year. The greater development in these organs is correlated with an increased diameter of the seminiferous and epididymal tubules, an increase in the height of the epithelium lining of the tubules, and an increase in the amount of fat in the interstitial cells of the testis. The testis varied from 0.016 percent of the body weight in the quiescent period to 0.219 percent in April.

Spontaneous activity in male rats in relation to testis hormone, R. E. HELLER (*Endocrinology*, 16 (1932), No. 6, pp. 626–632).—From studies of the voluntary activity of normal male and castrated rats, before and after administration of extracts of the testis hormone, it was apparent that voluntary activity was not a good measure of the testis hormone as the amount of activity was very irregular, although less average activity was shown by castrated animals.

An improved fluid for mammalian sperm-suspensions, J. R. BAKER (*Quart. Jour. Expt. Physiol.*, 21 (1931), No. 2, pp. 139, 140).—A buffered glucose-saline solution which promotes the activity of mammalian spermatozoa is suggested. The results of tests of several modifications in the solution are noted.

The effect of destruction of the spermatogenic tissue by X-rays upon certain secondary gonadic characters of the cock, L. MIRSKAIA and F. A. E. CREW (*Quart. Jour. Expt. Physiol.*, 21 (1931), No. 2, pp. 135–138, pls. 3).—The germinal tissue of the testes of four cocks was destroyed by X-rays without resulting influence on the head furnishings, voice, or behavior, indicating that these secondary sex characters are not dependent for maintenance on the spermatogenic tissue.

The spermatogenesis of the mouse (*Mus musculus*, var. *albula*), P. R. CUTRIGHT (*Jour. Morph. and Physiol.*, 54 (1932), No. 1, pp. 197–220, pls. 4).—Spermatogenesis in the mouse is described from studies of sections of the testes of animals of varying ages. Young animals 6 to 8 weeks old, however, gave the best results. The diploid chromosome number of 40 was verified in the spermatogonia and in the embryonic somatic tissue. The probable X and Y chromosomes were also identified. Other details of the process are described and illustrated.

A case of intersexuality in *Bos indicus*, with a theory of the significance of the genetic male intersex, D. R. R. BURT (*Roy. Soc. Edinb. Proc.*, 50 (1929–30), No. 2, pp. 113–129, pls. 2).—The gross anatomy and histology of the genitalia of a zebu exhibiting both male and female characteristics is described.

The effects of alcohol on the germ cells of male rabbits, R. B. HINMAN and H. J. METZGER (*New York Cornell Sta. Rpt.* 1932, p. 109) —Alcoholization

of male rabbits increased the percentage of abnormal young and the rate of resorption of young sired by them.

Mammary development and function, S. A. ASDELL and L. L. MADSEN (*New York Cornell Sta. Rpt. 1932, pp. 105, 106*).—A brief account is given of a successful attempt for a short time to stimulate milk secretion in goats by administration of an extract of the anterior lobe of the hypophysis.

Menstruation in *Pithecus (Macacus) rhesus* following bilateral and unilateral ovariectomy performed early in the cycle, G. VAN WAGENEN and S. B. D. ABERLE (*Amer. Jour. Physiol., 99 (1931), No. 1, pp. 271-278, figs. 6*).—Bilateral ovariectomy performed at different stages in the cycle, varying from 72 hours to 13 days, was followed in 5 or 6 days by menstruation in 4 macaques, but did not induce bleeding when the ovaries were removed on the first day on which menstruation was noted. Unilateral ovariectomy in two animals on the fourth day induced menses in one and not in the other.

FIELD CROPS

The principles of orthogonality and confounding in replicated experiments, F. YATES (*Jour. Agr. Sci. [England], 23 (1933), No. 1, pp. 108-145, figs. 7*).—"Orthogonality is that property of the design which insures that the different classes of effects to which the experimental material is subject shall be capable of direct and separate estimation without any entanglement." The principle of orthogonality in replicated experiments is discussed, the dangers of nonorthogonality emphasized, and modifications needed in ordinary procedure of analysis of variance when applied to nonorthogonal data are developed, with attention to the shorter methods. Certain modifications in the design of replicated experiments, usually designated by the term confounding, are explained, and the different types of confounding and their uses are discussed, with appropriate methods of analysis. The methods are applied to the analysis of the experiment on sugar beet by Wishart (*E.S.R., 67, p. 672*) and a potato experiment by Eden and Fisher (*E.S.R., 63, p. 731*).

On the validity of Fisher's z test when applied to an actual example of non-normal data, T. EDEN and F. YATES (*Jour. Agr. Sci. [England], 23 (1933), No. 1, pp. 6-17, figs. 5*).—A practical test was made on a skew distribution obtained from the observation of 256 height measurements on wheat grown at Rothamsted, and the distribution of values of R. A. Fisher's z from 1,000 random samples was obtained and found to agree satisfactorily with the theoretical distribution. The results indicated that the z test might safely be applied to data of this type. Previous work on the validity of the t and z tests on nonnormal distributions is reviewed.

[Field crops experiments at the Alaska Stations, 1931 and 1932], C. CORDY, J. C. WINGFIELD, and F. L. HIGGINS (*Alaska Stas. Rpt. 1931-1932, pp. 3, 4, 5, 6, 11, 12-14, 17, 18, 19, 22, 23, 24*).—Experiments (*E.S.R., 66, p. 626*) reported on for 1931 and 1932 included variety trials with spring wheat, barley, oats, flax, potatoes, beets, turnips, carrots, alfalfa, sweetclover, and grasses for lawns, and cover crops; time of digging potato varieties; trials of oats and peas for silage, and oats and vetch for hay; comparison of cutting oats and vetch hay with a binder and with a mower; and weed control. Analyses are tabulated for cotton sedge (*Eriophorum vaginatum*), native blue top grass (*Calamagrostis* sp.), and native sedge (*Carex aquatilis*) harvested at different growth stages, and bird vetch, alfalfa, and brome grass harvested in full bloom, all grown at Fairbanks in 1929. The accomplishments of the station in introducing and developing suitable varieties of cereals, potatoes, and forage roots, grasses, and legumes are reviewed briefly.

[**Agronomic experiments in California**] (*California Sta. Rpt. 1932*, pp. 49-51, 66, 67, 68).—These pages report the progress results (E.S.R., 67, p. 516) of breeding work with Sudan grass, grain sorghum, and rice; variety tests with flax; oats and legume mixtures for hay; cutting tests with alfalfa; burning to control weeds and aphids in alfalfa; fertilizer tests with rice and corn; benefits of cover crops on milo, cotton, and cantaloupes; effects of plowing under straw on the succeeding grain crop; effects of sorghum residues on physical condition of the soil; weed control by use of arsenicals, chlorates, and other chemicals; studies on St. Johnswort (E.S.R., 64, p. 737) and on the feed value of Pahute weed (*Suaeda depressa*); and experiments on the merits of burning alfalfa and grazing lands. Some of the work was in cooperation with the U.S. Department of Agriculture.

[**Agronomic research in Delaware**], G. L. SCHUSTER, H. C. HARRIS, and C. E. PHILLIPS (*Delaware Sta. Bul. 179 (1932)*, pp. 11-18).—Field crops experiments (E.S.R., 66, p. 526) reported on briefly included a variety trial with alfalfa; a date-of-seeding test with barley; fertilizer studies with wheat, alfalfa, barley, and sweetpotatoes; and a storage test with sweetpotatoes from the several fertilizer treatments.

[**Field crops work at the Georgia Coastal Plain Station, 1931**] (*Georgia Coastal Plain Sta. Bul. 19 (1932)*, pp. 11-57, 66-72, 88-93, figs. 6).—Agronomic experiments (E.S.R., 66, p. 626) reviewed for the current season and for various periods comprised variety tests with cotton, corn, oats, wheat, rye, barley, peanuts, lespedeza, soybeans, and cowpeas for hay and seed, winter field peas, vetch, *Crotalaria*, sweetpotatoes, and tobacco; a source of seed test with potatoes; breeding work with corn; fertilizer trials with cotton, corn, oats, peanuts, velvetbeans, sweetpotatoes, potatoes, and tobacco; effect of lime, green manure, and superphosphate on oats; winter cover crops for cotton and corn; cultural (including planting) experiments with oats, wheat, cotton, soybeans, winter field peas, vetch, sweetpotatoes, potatoes, and tobacco; pasture studies; and a study of color inheritance in sweetpotatoes. Certain lines of research were in cooperation with the Georgia College of Agriculture, the Georgia Experiment Station, and the U.S. Department of Agriculture.

[**Field crops experiments in Indiana**] (*Indiana Sta. Rpt. 1932*, pp. 19-21, 28, 29, 47, 58, 59, 63, 64, 65, figs. 4).—Research with field crops (E.S.R., 67, pp. 516, 667), reviewed briefly, included breeding work with wheat, oats, soybeans, and red clover; adaptation studies with new oats varieties, strains of red clover, and varieties of lespedeza; comparison of Indiana-grown v. imported seed potatoes; cutting tests with alfalfa; a fertilizer test with tobacco; trials of nitrogenous fertilizer for corn as a possible aid in control of European corn borer; studies of the effects of fertilizers and of leaf rust on the yield, composition, and quality of wheat; fertilized crop rotations; place in the rotation to apply manure; soil fertility studies; pasture improvement; and weed control with chlorates and other chemicals.

[**Farm crops experiments in Iowa**] (*Iowa Sta. Rpt. 1932*, pp. 40, 41, 42, 45, 46, 60-73, 89, 90, 105, 106, 107, fig. 1).—Brief reports are given on the progress (E.S.R., 67, p. 377) of work by R. H. Porter, C. M. King, A. L. Bakke, J. M. Aikman, F. G. Bell, C. S. Reddy, L. C. Burnett, H. D. Hughes, F. S. Wilkins, P. E. Brown, F. B. Smith, J. B. Wentz, C. Y. Cannon, M. T. Jenkins, A. A. Bryan, J. L. Robinson, W. G. Gaessler, R. W. Jugenheimer, H. Giese, E. W. Lindstrom, and A. T. Erwin, including breeding work with oats, barley, wheat, reed canary grass, potatoes, and soybeans; variety tests with oats, flax, alfalfa, red clover (strains), soybeans, and sorgo; trials of legumes and grasses for hay and pasture; variety-cultural experiments with oats, wheat, and barley; cultural studies with reed canary grass and sugar beets, and with alfalfa on

bacterial wilt infected soil; the relation of moisture to respiration in stored oats; technic for determining water content of green forage; trials of nurse crops for small-seeded legumes; trials of legumes for green manure; storage and fertilizer tests with sweetpotatoes; tests of agricultural seed for purity and germination; studies of the annual spread of and control methods for creeping Jennie and leafy spurge; and eradication of biennial sweetclover by cultivation.

Corn investigations dealt with genetic interrelations and prepotencies of inbred lines; the relation of time of planting to yield and quality of produce among crosses between inbred lines; comparison of inbred lines obtained from open-pollinated varieties and from crosses between inbred lines; improvement through the use of inbred lines; the relation between the development and seed value of the corn kernel; ear and kernel characteristics of seed corn in relation to yield; the measurement of limiting environmental factors in the growth of the plant at different rates and spacings; correlation between composition and stiffness of stalk; rate, date, and method of planting varieties differing in maturity; a study of varieties and strains in different parts of Iowa; a statistical study of the relation of size and shape of plat and number of replications to precision in yield comparisons; and storage studies. Certain phases of the research were in cooperation with the U.S. Department of Agriculture.

[Field crops and plant breeding research in New York] (*New York Cornell Sta. Rpt. 1932*, pp. 91, 113, 130, 131, 162, 163).—These pages give brief accounts of the progress of breeding work with corn, wheat, oats, barley, beans, and potatoes; of potato experiments concerned with adaptation of types and varieties to muck soil and new and improved strains; of the effect of liberal nitrogenous fertilization on yields and nitrogen content of timothy hay; and of tests of grass mixtures for pasturage.

[Field crops investigations in Ohio] (*Ohio Sta. Bul. 516 (1933)*, pp. 22-29, 30, 31, 33, 34, 35, 36, 42, 43, 63, 64, 67, 107, 111, 112, fig. 1).—Agronomic experimentation (E.S.R., 67, p. 29), for which results are reported, dealt with drilling light applications of lime with clover seed, by R. M. Salter; the fertility value of hay crops in the rotation, by E. E. Barnes; sodium chlorate-limestone mixtures as weed killers for dry application, by C. J. Willard; effect of fertilizers on seedling stands of sugar beets, by J. S. Cutler and J. B. McLaughlin; alfalfa and grass mixtures v. pure stands, by L. E. Thatcher; the value of the coarser particles in ground limestone, by Salter; cultipacking and mulching wheat, by H. L. Borst; comparisons among corn hybrids and varieties, by G. H. Stringfield; the effect of fertilizers upon grain texture and protein content of wheat, by E. G. Bayfield; control of crabgrass by shading, by F. A. Welton; the effects of plat arrangement upon experimental error, by J. T. McClure; the form of potassium in corn tissues, by V. H. Morris; the variability of certain characters in corn, by J. D. Sayre; control of Canada thistle and horse nettle with sodium chlorate sprays, by H. A. Runnels; fertilizer placement studies with potatoes, by J. Bushnell; spacing, spraying, and overhead irrigation tests with potatoes, by D. Comin and Bushnell; trial of the clover-alfalfa-timothy mixture on meadows, by M. A. Bachtell and H. Allen; sugar beet yields in different rotations and on different preparations, by Bachtell and H. R. Hoyt; and steaming of tobacco plant beds and use of corn stalks to loosen plant bed soil, both by Cutler and H. M. Wachter.

Several of the investigations were in cooperation with the U.S. Department of Agriculture.

[Field crops work in Puerto Rico, 1932], T. B. McCLELLAND, R. L. DAVIS, and H. C. HENRICKSEN (*Puerto Rico Sta. Rpt. 1932*, pp. 2, 6-8, 11-16, 19,

figs. 2).—Brief progress reports are given as heretofore (E.S.R., 67, p. 517) on breeding work, trials of seedlings, hybrids, and introduced varieties, studies of arrowing of varieties, and determination of the rate of movement of lithium in the plant, all with sugarcane; breeding work with corn and yams; fertilizer trials with dasheens, taros, and yautias; and tests of corn varieties and hybrids.

The corn and soybean combination, H. L. BORST and J. B. PARK (*Ohio Sta. Bimo. Bul.*, 18 (1933), No. 2, pp. 37-42).—This study of growing corn in combination with soybeans for silage or grain has been noted (E.S.R., 68, p. 610).

Manuring of meadow-hay land: The effect of manures and lime on the botanical composition and yield of hay, W. A. JACQUES (*Jour. Agr. Sci. [England]*, 23 (1933), No. 1, pp. 146-160, *figs. 2*).—An experiment begun by the late W. Somerville at Leeds University Farm, Garforth, in 1899 and in progress up to 1927 dealt with the effects of manure, fertilizer, and lime on yield and botanical composition of meadow hay. The soil is a light loam derived from a coal measures sandstone, naturally sour, and produces a poor type of herbage typical of a large area.

During the first period, 1899-1911, manure each year and manure alternating with complete or incomplete fertilizer with sodium nitrate gave the highest yields. All the manured plats yielded better than any of the fertilized plats, on which there was a progressive decrease in productivity with the omission of potash and then superphosphate from the complete mixture. Sodium nitrate in all cases produced heavier yields than ammonium sulfate. In the second period, 1912-27, the unlimed half-plats occupied about the same position in average production as in the first period. The manured plats still maintained their superiority over fertilized plats and the sodium nitrate outyielded the ammonium sulfate plats, yet the average level of production was more than 0.5 ton less than in the first period, indicating that the continual removal of hay from the same land each year, even in conjunction with heavy and complete fertilizing, depresses yield. The limed half-plats, excepting two which were manured, outyielded the corresponding unlimed halves. The increase was greatest on controls and on plats receiving fertilizers only, and was least with manure alone or when supplemented with fertilizers.

In regard to the herbage, continuous applications of ammonium sulfate, with or without lime, induced no improvement as compared with the controls, although the yield was somewhat greater. Sodium nitrate brought about an improvement over ammonium sulfate by reducing bent and sweet vernal and increasing the orchard grass. Complete fertilizer proved better than incomplete fertilizer, although kainit had little effect on the floral composition. Manure without lime encouraged orchard grass and rough-stalked meadow grass, but depressed tall oatgrass. Where manure was used annually the proportion of undesirable plants in the hay was less than on any other plat. Manure and lime tended to suppress bent and Yorkshire fog. Manure gave a better hay than complete fertilizers, as with the latter sheep's and hard fescues, sweet vernal, and bentgrass replaced orchard grass, which became abundant with manure. The effect of lime on the individual species varied with the manuring. The behavior of the plants in response or otherwise to lime and manures often agreed closely with Rothamsted findings by Brenchley (E.S.R., 54, p. 435).

Alfalfa production under irrigation in western Texas, J. J. BAYLES (*Texas Sta. Bul.* 472 (1932), pp. 28, *figs. 10*).—Production and irrigation practices for growing alfalfa for hay under irrigation in western Texas are described, with information on the climatic, soil, and fertility needs of the crop, its place in rotations, the seed crop, varieties, pasturing alfalfa, and the control of

weeds and insect pests. Fertilizer trials with alfalfa and a study of the effect of fallow on the control of cotton root rot (*Phymatotrichum omnivorum*) in alfalfa fields, both conducted at the Balmorhea Substation, are reviewed briefly.

Another yield trial with Pusa barleys: The method of analysis of variance, R. D. BOSE (*Agr. and Livestock in India*, 2 (1932), No. 6, pp. 603-618).—Yield trials with four Pusa barleys, conducted in randomized blocks and Latin squares and the data analyzed by Fisher's analysis of variance method, proved the superiority of Type 21 over Types 12, 20, and 7 in order, confirming earlier results in trials employing the chessboard method and the strip and block methods.

Red-clover seed production in the Intermountain States, E. A. HOLLOWELL (*U.S. Dept. Agr. Leaflet 93* (1932), pp. 7, figs. 2).—Cultural methods and field practices are suggested for the production of red clover seed in the Intermountain States.

Some effects of high temperature on polyploidy and other variations in maize, L. F. RANDOLPH (*Natl. Acad. Sci. Proc.*, 18 (1932), No. 3, pp. 222-229; *abs. in New York Cornell Sta. Rpt. 1932*, p. 113).—Heat (38° to 45° C.) was applied locally to the ear shoots of corn for two days beginning 27-30 and 22-24 hours after pollination. The ear-shoot region of the plant was inclosed within a wire mesh cylinder plugged at the ends with cotton and surrounded by an electrical heating pad. Effects of the heat treatments noted included (1) doubling of entire chromosome sets; (2) chromosomal deficiencies and translocations; (3) direct morphological effects resulting in defective and scarred endosperms, germless grains, and dwarfed and otherwise defective seedlings and mature plants; (4) sterilization of ovules and pollen at the higher temperatures; and (5) deviations from the normal fertilization process, such as failure of syngamy, atypical syngamic unions, and parthenogenesis. The higher temperatures were more effective than the lower in producing tetraploids and aberrant kernel types.

In a study of the effects upon the fertilization process of heat treatments applied separately and in combination with X-radiation at the time of syngamy, the following variations were noted: A new type of endosperm chimera not previously reported in corn, a diploid glossy seedling produced from a colored starchy grain, a maternal diploid seedling, and a maternal haploid. Possible applications of the technic are suggested.

Chemical transformations of phosphorus in the growing corn plant, with results on two first-generation crosses, E. E. DETURK, J. R. HOLBERT, and B. W. HOWK (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 2, pp. 121-141, figs. 5).—A preliminary study of the distribution of various chemical forms of phosphorus in the corn plant at different stages of its development, and the distribution of the total phosphorus among four groups of compounds, organic and inorganic, in two F₁ crosses is reported by the Illinois Experiment Station cooperating with the U.S. Department of Agriculture.

In field-grown open pollinated corn plants a gradual decrease in percentage concentration of phosphorus during rapid vegetative growth was observed, and a sudden drop in concentration in the vegetative portion took place at about pollination. During the early ear-formation stage there was an upward gradient in total phosphorus concentration from the roots through the stalk and shank to the ear. Phytin was consistently absent from all parts of the plant before pollination, and after pollination it occurred only in developing or mature seeds. A relation of the phytin-forming function to fertilization is indicated, and the pollen is suggested as the carrier of the activator of the phytin-synthesizing enzyme. Phytin disappeared rapidly from germinating corn seeds.

In two F_1 crosses which varied greatly in their response to phosphate fertilizers, phosphorus was separated into four fractions at each of five growth stages, extending from 36 days before until 11 days after pollination. Two fractions, inorganic and organic phosphorus compounds soluble in cold aqueous 2 percent HCl, were labile and readily retransported from older tissue into ears, and possibly into younger vegetative tissues. These compounds are believed to be primarily transport and storage forms and not essential constituents of protoplasm. The remaining fractions, i.e., phospholipids (absolute alcohol extract) and acid-insoluble organic phosphorus compounds (nucleic acids and nucleoproteins) remained constant in percentage of the dry matter throughout the experiment, and are believed to be constituents of the cell protoplasm and not subject to reutilization, with the possible exception of a breakdown of small amounts of phospholipids. Chemical differences in the two F_1 crosses did not reveal causes of the differences in response to phosphate fertilizers.

The effect of fertilizers, crop rotation, and weather conditions on the anchorage of corn plants, N. A. PETTINGER (*Virginia Sta. Tech. Bul. 46* (1933), pp. 36, figs. 8).—The effect of different plant nutrients, crop rotation, and weather conditions on the root development and anchorage of corn plants, as determined by the resistance of the plants to vertical pull, and the percentage of plants leaning 20° or more, were studied from 1927 to 1932.

Application of nitrogenous fertilizers to a soil slightly deficient in nitrogen increased the anchorage of corn plants slightly when the available potassium was adequate, but when this was not ample, addition of nitrogenous fertilizers decreased the anchorage to a small extent. In a soil deficient in available phosphorus, application of phosphatic fertilizers markedly increased the anchorage, superphosphate being far superior to rock phosphate in this respect. Stable manure alone was slightly more effective than stable manure supplemented with either rock phosphate or superphosphate in providing the plants with good anchorage. Potassic fertilizers (E.S.R., 66, p. 19) also greatly improved the anchorage of plants in a soil low in available potassium. Under the experimental conditions potassium and phosphorus in order increased root anchorage more than did nitrogen, the relative stimulative effects being about inversely proportional to the extent in which each element was deficient in the soil in available form. The percentage of leaning plants and the resistance to vertical pull both showed a high positive correlation with soil productiveness, indicating that fertile soils are more favorable to root growth than unproductive soils. Root anchorage was correlated positively with the degree of completeness of fertilization.

Crop rotation was found to be more favorable to good root development and anchorage of corn plants than was the growing of corn continuously. Weather conditions appeared to exert a stronger influence than fertilizers or cropping system in determining the amount of lodging. The amount and distribution of rainfall evidently has more influence than wind velocity. Lodging is encouraged by excessive rainfall but not by subnormal rainfall. The concentration of rainfall during August seemed to encourage lodging more than the concentration at other times in the growing season. Wind velocity increased lodging when rainfall was abundant, but was ineffective with subnormal rainfall. The simultaneous occurrence of rainfall and fast-moving winds appeared to be more effective than either factor alone in producing lodging in corn.

On the variation of certain characters of cotton in relation to the position of seeds in a lock, K. R. SEN (*Indian Jour. Agr. Sci.*, 2 (1932), No. 5, pp. 484-498, figs. 2).—Studies on well-opened bolls of the Punjab-American cottons known as Early Strain, 4 F, and 289 F, showed that the seed weight

and lint weight are correlated. The apical seeds gave the lowest seed and lint weights, although the seed and lint weights of the basal seeds were also low. Experiments with the Early Strain only indicated that the apical seeds give fibers of the least weight per unit length, the lowest ginning percentage, and the fewest hairs per seed, whereas the fiber weight per unit length and the ginning percentage are highest for the basal seeds. The average fiber length did not seem to vary with the seed positions. The results are in accord with Turner's conclusions (E.S.R., 63, p. 827) as to the absence of correlation between the numbers of hairs per seed and either the ginning percentage or the seed weight. A statistical note on the analysis of variance, by S. S. Iyer, is appended.

Physiological factors affecting the fruiting of cotton with special reference to boll shedding, R. S. HAWKINS, R. L. MATLOCK, and C. HOBART (*Arizona Sta. Tech. Bul.* 46 (1933), pp. 361-407, pls. 3, figs. 30).—Anatomical and physiological aspects of the cotton plant, studied in relation to environmental conditions and with particular reference to soil-moisture relations, included fruiting behavior—flowering, shedding of bolls, and maturity of bolls; osmotic values and specific conductivity of the expressed leaf fluids; carbohydrate and nitrogen relations; and certain anatomical differences determined from cross sections of the stems of representative plants. The studies were made on Acala cotton grown in field plats variously irrigated.

The osmotic pressure and specific conductivity of the leaf sap and the carbohydrate content of the stems usually were correlated inversely with the available soil moisture. The amount of available soil moisture, through its influence on food conditions within the plants, appeared to be a major factor in regulating the fruiting behavior of cotton plants. Relatively high osmotic pressures of the leaf sap almost invariably were followed by low percentages of shedding of the bolls, the flowers of which opened simultaneously with the occurrence of high osmotic pressures. High shedding also followed extremely high osmotic pressures induced by severe reductions in soil moisture, and increased shedding practically always followed low osmotic pressures. Curves representing the specific conductivity of the leaf sap paralleled the osmotic-pressure curves with exceptional consistency, and the percentages of carbohydrates in the stems were correlated fairly closely with the osmotic pressures of the leaf sap. The interrelation of osmotic pressure and specific conductivity of the leaf sap, and the carbohydrate content of the stems, and the close inverse correlation of these three properties with shedding were held to furnish additional evidence that the percentage of shedding is regulated by the amount of plant food available for the development of the young bolls.

Cambial activity was directly correlated with available soil moisture. Rapid vegetative growth, as expressed in the formation of large, thin-walled cells in the secondary tissues of the stems, was accompanied generally by increased boll shedding, probably due to the lack of plant food for vegetative and fruiting requirements. Very slow vegetative growth, induced by lack of soil moisture following a period of normal growth, was accompanied by relatively inactive cambium, the formation of small cells, the thickening of the cell walls of the young cells, increased carbohydrate content of the stems, lower nitrogen content, and intense shedding. The total amount of pith and of cortical tissues did not change materially from July 14 to October 1, irrespective of soil-moisture conditions. The area of xylem in cross sections of the stems of plants well supplied with water considerably exceeded that in plants with limited soil moisture. The expansion in the amount of phloem also was stimulated by increased soil moisture, although to a lesser extent than was the xylem. Resumption of increased vegetative growth, as indicated by accelerated cambial activity following the termination of periods of water deficit of varying in-

tensities, was of about equal proportions irrespective of the state of cambial activity during such periods.

Periods of water shortage, initiated after the flowering season was well started, reduced the length of the flowering period in proportion to the intensity of the water deficit. The first bolls opened on all plats at about the same date, August 18 and 19, irrespective of soil moisture differences.

Fertilizer experiments with cotton, E. B. REYNOLDS, G. T. MCNESS, R. A. HALL, P. R. JOHNSON, R. H. STANSEL, H. DUNLAVY, P. B. DUNKLE, and H. F. MORRIS (*Texas Sta. Bul.* 469 (1932), pp. 31).—In fertilizer experiments with cotton reported on from the station and several substations for different periods from 1925 to 1931, inclusive, the various treatments were based on a 4-12-4 mixture at the acre rate of 400 lb. Previous fertilizer work with cotton in Texas is reviewed.

The sandy soils in eastern Texas, i.e., the Kirvin fine sandy loam at Troup and Nacogdoches and Ruston fine sandy loam at Nacogdoches were found to be deficient in nitrogen and phosphoric acid, and to a lesser extent in potash. The application of 200 to 400 lb. per acre of a 4-8-4 or a 4-6-4 fertilizer, or a mixture furnishing similar ratios and amounts of plant food is recommended for cotton on these soils. That Lake Charles clay, an extensive soil in the Gulf Coast Prairie, is markedly deficient in phosphoric acid, was indicated by results obtained at Angleton. The use of 100 lb. of superphosphate or from 200 to 600 lb. of a 4-8-0 fertilizer per acre was recommended for cotton on this clay and similar soils of the region. The Lufkin fine sandy loam at College Station responded better to phosphoric acid and potash than to nitrogen. The 4-12-4 and 0-12-4 fertilizers at the acre rate of 400 lb. were the most profitable treatments on this soil. Although cotton responded somewhat to fertilizers on the dark colored Goliad fine sandy clay loam at Beeville, Houston black clay and Houston clay at Temple, and San Saba clay at Denton, in general the use of fertilizers was not profitable on these soils.

Conference on cotton growing problems, August 1930—Report and summary of proceedings (London: *Empire Cotton Growing Corp.*, 1930, pp. 166, figs. 10).—The proceedings of the conference of British Empire cotton workers held in August 1930, at Shirley Institute, Manchester, are reported. Papers presented, with discussion, included General Problems in the Investigation of Cotton Quality, by F. T. Peirce (pp. 9-13); Immaturity of Cotton, by G. G. Clegg (pp. 13-17); The Causes of Nep in Cotton, and the Possibilities of Its Prevention, with Special Reference to the Sudan, by M. A. Bailey (pp. 17-39); "New Place Effect" on Cotton, by J. B. Hutchinson (pp. 40-51); Uniformity of Cotton, Variation in Length, Hair Weight, etc., by C. Underwood (pp. 74-88); Methods of Correlating the Strength of Cotton Yarn with Hair Properties, by G. A. R. Foster and J. Gregory (pp. 88-95); Field Experiments and the Analysis of Yield Variation in Cotton, by E. J. Maskell (pp. 96-111); The Inter-relation of Factors in Determining the Growth of the Cotton Crop in the Sudan, by F. G. Gregory, F. Crowther, and A. R. Lambert (pp. 112-129); Black-Arm or Angular Leaf Spot Disease of Cotton Plants, by R. H. Stoughton (pp. 130-144); Note on Erosion and Soil Alkali, by A. F. Joseph (pp. 144-152); and Grafting and Graft-Hybrids in Connection with Cotton Plants, by F. E. Weiss (pp. 158-163).

Approved practices for peanut growers, B. F. FULTON, P. H. KIME, S. G. LEHMAN, and H. B. MANN (*North Carolina Sta. Bul.* 281 (1933), pp. 6).—Practices recommended for peanut production in North Carolina, based on results of experiments and the experience of successful growers, deal with the choice of varieties and soils, the use of lime, fertilizers and gypsum, cultural and

harvesting methods, care of seed, rotations, and the control of plant diseases and insect pests.

Effect of reduced oxygen pressure on rice germination, J. W. JONES (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 1, pp. 69–81, fig. 1).—Germination studies with rice were made during several seasons by the U.S. Department of Agriculture cooperating with the California Experiment Station.

Rice sown in the field on the soil surface and 0.5 in. and 1 in. deep, and then submerged continuously, averaged 78.14, 20, and 2.66 percent of seedlings, respectively. No seedlings were obtained from seed sown 1.5 to 2.5 in. deep and submerged continuously, either in the field or in pots in the greenhouse, except when oxygen was forced into the soil. All seed sown on the soil surface either germinated and produced normal seedlings or failed to germinate. Of the seed sown 0.5 in. deep in the field, an average of 25.78 percent produced plumules only. With increase in depth of seeding, however, the percentage of seed producing only plumules decreased, and the percentage of seed failing to germinate increased materially. Indications are that when continuously submerged, a 0.5-in. layer of Stockton clay adobe soil materially reduced the oxygen pressure, and a layer 1 in. or deeper so reduced the oxygen pressure that normal germination did not occur. Oxygen sufficient to initiate growth of the radicle seemed to be lacking under such conditions. Seeding in the water (surface seeding in these experiments) appeared to be the best practice when rice is grown by continuous submergence.

Germinations in pots into which oxygen was forced, especially in sand, gave indications that a deficiency of oxygen probably is the main factor inhibiting normal germination in rice seed sown at various depths and continuously submerged. The development of the radicle is initiated by a suitable supply of oxygen.

Early seeding is deemed preferable to late seeding because air and water temperatures are lower early than later in the spring, and more oxygen is dissolved in cool than in warm water. The dissolved oxygen at the lower temperatures results in a larger percentage of seedlings than can be obtained at higher temperatures.

Flowering, pollination, and natural crossing in rice, W. POGGENDORFF (*Agr. Gaz. N.S. Wales*, 43 (1932), No. 12, pp. 898–904).—Observations during five years of improvement work with rice at Yanco, New South Wales, are compared with similar records in other rice-growing countries. The minimum temperature at which flowering occurred at Yanco was 72° F., relative humidity 62 percent, and maximum flowering occurred at 85° to 90° with humidity 55 to 70 percent. The highest temperature at which flowering was observed was 102°, humidity 60 percent. The same response was made to a given set of conditions by all varieties studied. Time of flowering varied with weather conditions, usually commencing at 8:30 a.m., reaching a maximum between 11:30 a.m. and 12:30 p.m., and ceasing about 3:30 p.m. The extremes observed in flowering time were 6 a.m. and 5:30 p.m. Wind, clouds, and rain affected flowering adversely. Relative humidity was the most important factor governing the amount of flowering between 72° and 100°.

The three types of pollination observed are described. The glumes opened to a maximum angle of about 30° in from 1 to 3 minutes and remained open for 13 to 75 minutes, the time apparently being governed by relative humidity. Cleistogamy was not observed. Pollination appeared more likely to occur after rather than at opening of the florets in long-glumed varieties. Natural crossing was observed and might be attributed to several causes.

Autogamous Turkestan rye, B. M. BENSIN (*Bul. Torrey Bot. Club*, 60 (1933), No. 3, pp. 155–160, figs. 3).—A new species of rye (*Secale turkestanicum*)

found in cultivation in 1912 in Syr Darya Government differs from ordinary rye in invariable development of three flowers instead of two in each spikelet; frequent maturity of the fruit of the uppermost flower; complete enclosure of the flower in the lemma and palea, and consequent self-pollination instead of an open flower with cross-pollination; firm attachment of the kernels and consequent nonshattering upon maturity instead of easily shattering kernels; stronger development of villous hairs at the base of each spikelet; and dark, almost black, color of the kernels. It is assumed to be a more primitive species than *S. cereale*, and it seems better adapted to a wild state and more resistant to drought.

New varieties of grain and forage sorghums, H. H. FINNELL ([*Oklahoma Panhandle Sta., Panhandle Bul.* 47 (1933), pp. 8).—The yields of grain and total forage made by new sorghum varieties grown for 1 to 6 years in 3.5- and 7-ft. rows are tabulated in comparison with yields of the established varieties Dwarf Yellow milo, Dawn kafir, and Sunrise kafir. Beaver milo, Double milo, and Heilman milo (6 years) and Club kafir (4 years) were the only new sorts yielding more grain than Dwarf Yellow milo. Kansas Orange, the only new sorghum to yield more forage than Sunrise kafir during 4 years, produced only half as much grain as the latter. The origins of new varieties, not noted previously (*E.S.R.*, 64, p. 336), are described.

Sudan grass culture, L. E. THATCHER (*Ohio Sta. Bimo. Bul.*, 18 (1933), No. 2, pp. 32-34).—Practical information is given on the soil, fertilizer, and cultural needs of Sudan grass, with observations on its reaction to hot dry weather, utilization of the crop, and Sudan grass-soybean mixtures.

Fertilizer requirements of sugar cane on Yazoo very fine sandy loam in Louisiana, A. M. O'NEAL, L. A. HURST, and S. J. BREAUX, JR. (*Jour. Amer. Soc. Agron.*, 24 (1932), No. 11, pp. 888-898, figs. 9).—Fertilizer tests according to the triangle system, made on several outlying fields in Louisiana, showed that the best yields of sugarcane and sugar usually were made with combinations high in nitrogen, the 12 percent nitrogen line showing consistently high returns. The effects of different fertilizer constituents on the growth of the cane were quite evident, e.g., P.O.J. 213 from a 12-4-4 plat was comparatively straight while that from the nitrogen plat (20-0-0) was crooked. Increase in the length of millable cane was in direct proportion to the amount of nitrogen up to the 12 percent combination, beyond which there was practically no improvement. The 12-4-4 mixture evidently produced the most satisfactory cane, showing an average length of 5.75 ft. of millable stalk.

The comparative effect of muriate and sulfate of potash on the composition and quality of White Burley tobacco, P. E. KARBAKER (*Kentucky Sta. Bul.* 334 (1932), pp. 341-356).—White Burley tobacco was grown for 6 years, 1924-29, on small plats fertilized with varying amounts of potassium sulfate and chloride. The effects of the treatments were determined on the appearance, feel, and chlorine and sulfur content of the tobacco, and in 2 years on its smoking qualities. In 1927 and 1928 tobacco was grown on larger areas and sold to a tobacco company so that the effects of the treatments on quality could be determined after the regular redrying, aging, and factory processes.

Some variation existed in the effects of the treatments in different years. In all years the addition of chlorine fertilizers increased the chlorine content of the tobacco. In most years no apparent injurious effect was noted on the tobacco from applications of 50 or 100 lb. of potassium chloride per acre. However, in 1927 a slightly injurious effect was observed from a 100-lb.-per-acre application. In another year no injurious effect was observed from a 200-lb.-per-acre application, although this quantity usually injured the tobacco to a considerable extent. Rates of 400 and 800 lb. per acre were quite injurious to

the appearance and other qualities of the tobacco. The potassium sulfate treatments affected the percentage of sulfur in the tobacco to a small extent, but had little or no effect on the appearance and feel.

The burning tests on the tobacco grown on the small plats in 1927 and 1928 showed that no detrimental effect resulted from the 50- and 100-lb. applications of potassium chloride. The 200-lb. applications of this material injured the burning qualities appreciably, and the 400- and 800-lb. rates to a marked extent. Some injury to burning qualities also resulted from applications of 400 and 800 lb. per acre of potassium sulfate. On the basis of these experiments and on similar soils no injurious effect on White Burley tobacco would be expected from application of 25 lb. per acre of chlorine in fertilizers, and in general no injurious effect of consequence would be expected from applications up to 50 lb.

Hard grain texture of wheat in mechanical mixtures and in crosses, W. E. BRYAN and E. H. PRESSLEY (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 1, pp. 64-69).—A partial report is given of Arizona Experiment Station studies made to ascertain to what extent hard grain texture is permanent in certain pure lines of wheats grown under irrigation. The grain yield and constancy of the hard texture of certain hard strains of Baart have been discussed earlier (E.S.R., 61, p. 639).

To test the possibility that the apparent progressive softening of certain hard-grain varieties might be due to admixtures of high-yielding soft strains as suggested by Freeman (E.S.R., 40, p. 142), three mixtures of hard Baart strain No. 34-14-17 and soft Baart No. 34-16, made up on the basis of kernel count, i.e., 25 percent hard and 75 soft, 50 hard and 50 soft, and 75 hard and 25 soft, were grown in comparison with the pure races during six years. There usually was a steady decline in the percentage of hard grains in all three mixtures, the changes over the period indicating that the average yield per plant in number of grains of the soft strain exceeded that of the hard strain. When grown separately in comparable spacings and when variations in stand were considered, the soft strain produced more heads per plant with close spacing than the hard strain, and this excess increased proportionately as the space per plant was increased. The difference in tillering or number of heads per plant seemed to account largely for the gain of the soft strain in mixtures with the hard.

When a hard Baart strain was crossed with a very soft pure line of Sonora wheat, the texture of F_1 kernels seemed as soft as self-fertilized Sonora kernels. Other crosses showed that hard Baart flowers pollinated with Sonora pollen produce kernels as hard as those produced by self-pollinated hard Baart flowers. Xenia did not seem to affect the expression of texture in these crosses. Definite segregation for texture clearly occurred in F_2 , although the number of factors involved was not so evident. It appeared probable that a single main factor separates the two types of texture, and that numerous modifying factors, also present, obscure the three expected classes in the heterozygote where dominance is absent.

Eight years' work by the Montana Grain Inspection Laboratory, July 1, 1923, to June 30, 1931, C. McKEE, W. O. WHITCOMB, W. D. HAY, and D. M. FEESE (*Montana Sta. Bul.* 270 (1933), pp. 52, figs. 8).—The activities of the laboratory (E.S.R., 48, p. 735) in testing wheat for protein, grain grading, seed testing, and seed inspection, and in research in these lines and in milling and baking are summarized for the period indicated. Research in the laboratory has largely been noted from other publications (E.S.R., 64, p. 216; 68, p. 753).

During the period 1925-30, more than 19,000 protein tests were made. The high protein year for spring wheat was 1930 and for winter wheat 1925, while both types were low in protein in 1927. The highest protein test for spring

wheat was 20.5 percent, and the lowest 8.2. The average protein content of hard red spring wheat in each year exceeded that of hard red winter wheat, the advantage varying from 0.98 percent in 1928 to 1.81 in 1930. Protein testing is still considered important from the viewpoint of milling and baking. Moisture content of wheat at the time of test had an important influence on protein percentage, i.e., the higher the protein content of the wheat the greater was the influence of moisture content, and as the moisture content decreased the protein percentage increased, and vice versa. Special features to be considered in protein testing are listed.

During the 8 years, a total of 14,703 grades was established. The percentage of Montana wheat grading no. 1 during the crop years 1923-30 ranged from 34.8 for hard winter wheat in 1930 to 87.2 for northern spring in 1928. Some wheats graded below no. 1 due to low test weight per bushel, excessive moisture, damaged kernels, and a few other causes. The test weight ranged from 50 to 67 lb. per bushel, although most wheat came within the range 59 to 62 lb. Dockage averaged below 1 percent in from 51 to 85 percent of the wheat graded during the period. Broken wheat kernels made up 38 percent of the dockage removed in grading from 200 lots of Montana wheat in 1920. The importance of smut dockage in wheat was shown by the fact that the percentage of car inspections of Montana wheat that graded smutty during the past 8 years ranged from 13.6 to 31.8. This percentage has been increasing. The percentage of wheat that graded mixed ranged from 2.4 in 1928 to 7.9 in 1923. About 60 percent of such wheat consisted of hard red spring and hard red winter, and the next combination was durum and hard red spring. Moisture content is considered a grading factor when it exceeds 14 percent, but it may lower premiums even when it exceeds 12 percent. Experiences of farmers with the wet wheat crop of 1925 showed that threshed wet wheat dries slowly or not at all on farms during freezing weather, and that artificial drying was expensive and unsatisfactory.

The number of samples of agricultural seed received for purity and germination tests ranged from 4,212 in 1923 to 5,589 in 1930. The purity of Montana alfalfa seed averaged 95 percent or more during the period, and the average germination by years ranged from 55 to 69 percent with 23 to 31 percent of hard seeds. Attention is called to the menace of dodder in seed, particularly in alfalfa.

HORTICULTURE

[**Horticulture at the Alaska Stations**], H. W. ALBERTS, C. CORDY, J. C. WINGFIELD, and F. L. HIGGINS (*Alaska Stas. Rpt. 1931-1932*, pp. 4, 5, 9-11, 12, 14-16, 18, figs. 3).—Following a brief review of the work accomplished by the stations since their beginning in the introduction of hardy fruits, vegetables, and flowers, there are presented the results of 1931 cultural tests of fruits, vegetables, and flowers, and fertilizer tests with grapevines and lawngrasses at the Sitka and Matanuska Stations.

[**Horticulture at the California Station**] (*California Sta. Rpt. 1932*, pp. 31-33, 37, 38, 39-46, fig. 1).—Discussions are presented upon the results of studies on the pollination of almonds, sweet cherries, apples, pears, and plums; abnormal sweet cherry blossoms and fruits; split pit and gumming of peaches; the movement of mineral plant foods in prune trees; application of superphosphate to apples and peaches; fertilizers and rootstocks for citrus; means of avoiding wind injury to citrus and persimmons; spacing of fig trees; picking frequency in relation to moldy walnuts; pruning, thinning, and girdling of grapes; rootstocks for grapes and grape varieties and breeding; genetics studies

with *Crepis*; and the improvement of truck crops, particularly tomatoes, carrots, lettuce, asparagus, and watermelons.

[**Horticulture at the Delaware Station**], L. R. DETJEN, L. H. STRUBINGER, C. A. McCUE, and F. S. LAGASSÉ (*Delaware Sta. Bul.* 179 (1932), pp. 38-43).—Further information (E.S.R., 66, p. 533) is presented on the progress of studies of the nature and causes of the dropping of young apple and peach fruits; premature flower stalk formation in cabbage as related to the position of the parent seed branch on the mother plant; the relative effect on peaches of nitrogen derived from different fertilizer sources; and the normal variations in apple trees growing on seedling and on own roots.

[**Horticulture at the Georgia Coastal Plain Station**] (*Georgia Coastal Plain Sta. Bul.* 19 (1932), pp. 57-62, 63-65, 72-88, 100-104).—Results are presented for varietal, cultural, and fertilizer trials with tomatoes, watermelons, and lima beans; varietal tests of asparagus, beans, peas, peppers, and other truck crops; varietal tests of apples, peaches, plums, pecans, pears, grapes, strawberries, figs, blueberries, blackberries, tung-oil trees, etc.; and cover crop trials with pecans and adaptation and selection trials with blueberries. In addition, the work at Darien involving fertilizer tests with tomatoes, beans, cabbage, and onions and variety tests with vegetables, fruits, and flowering bulbs is briefly discussed.

[**Horticulture at the Indiana Station**] (*Indiana Sta. Rpt.* 1932, pp. 45-47, 48, 49, 54, 55, 57, 64, figs. 3).—Among studies briefly reviewed are those in orchard soil management; apple pruning; apple stocks; stationary v. portable spray plants; codling moth control; apple storage; cost of washing apples; blooming time of plum varieties; resistance of asters to wilt; peat moss as a substitute for manure in the greenhouse; seed selection in tomatoes; effect of heating on color pigment of processed tomatoes; the marketing of Indiana tomatoes; the use of electric lights in the greenhouse; the effect of cultural treatments on growth and fruiting in the apple; effect of phosphorus and nitrogen deficiency in the amylase and invertase activity of tomato plants; effect of storage in alcohol on the sugar content of plant materials; methods for determining carbohydrates in plants; quantity of arsenic residue on apples; and the relation of stage of maturity and varieties to the canning quality of pumpkins.

[**Horticulture at the Iowa Station**], L. M. WEETMAN, E. C. VOLZ, T. J. MANEY, B. S. PICKETT, H. H. PLAGGE, H. L. LANTZ, V. T. STOUTEMYER, H. GIESE, E. S. HABER, A. T. ERWIN, P. M. NELSON, and P. SWANSON (*Iowa Sta. Rpt.* 1932, pp. 41, 42, 96, 97, 98-104, 105, 106, 107, figs. 2).—Reports are presented on the results of studies on the morphology and cytology of wilt-resistant types of melons; the storage of gladiolus corms; the breeding of improved varieties of chrysanthemums; methods of propagating own rooted apples; the growing of uniform rootstocks for apples; the correlation of bound water and hardness in apple wood; the comparative merits of various grafting waxes; the development of desirable new stocks for apples; soil management of apple orchards; methods of grafting to prevent formation of callus; the relation of storage temperatures to the keeping of apples; the effect of nitrogen fertilizers on the composition and keeping quality of apples; apple, pear, plum, and peach breeding; apple variety tests; grape pruning; the hybridization of black raspberries; the propagation of difficult and unusual plants; storage houses for apples; sweet corn breeding; asparagus culture; the pectin changes in stored tomatoes; cucurbit breeding; the vitamin A content of plants as associated with supplied nutrients; and substitute crops for cabbage and melon-sick soils.

[**Horticulture at the Ohio Station**], A. LAURIE, J. S. SHOEMAKER, J. H. GOURLEY, [R. M.] SMOCK, I. P. LEWIS, C. W. ELLENWOOD, F. H. BALLOU, H. D.

BROWN, O. N. RILEY, I. C. HOFFMAN, D. COMIN, S. C. HARTMAN, W. MAHAN, M. A. BACHTELL, and L. W. SHERMAN (*Ohio Sta. Bul. 516 (1933), pp. 55-63, 65, 66, 107, 108, 109, fig. 1*).—In accordance with the usual procedure (E.S.R., 67, p. 35), brief reports are presented on the progress of various studies, such as the growth of flowering plants under cloth; the effect of supplementing the daylight period with electric lights on the time of bloom of flowers; the treatment of cuttings with emulsified paraffin and liquid rubber and various methods of handling; the nutrient needs of shade trees and flowers; the protection of evergreen stock with paraffin; the fertilizer requirements of red and black raspberries; varieties of strawberries and sweet cherries; the development of apple roots as related to culture and soil types; the value of cyanamide as an orchard fertilizer; fertilizer requirements of apple trees; the age of maximum productivity in apples; the Turley apple; the spraying and dusting of apple orchards; grafting materials and methods; varieties of vegetables; the effect of soil moisture on the yield of greenhouse tomatoes; the irrigation of muck crops; and onion varieties.

In addition there are summarized the results of orchard dusting experiments at the Washington County Experiment Farm, nitrogen fertilizer studies with apples at the Belmont County Experiment Farm, and the effect of limestone on orchard vegetation at the Mahoning County Experiment Farm.

[**Horticulture at the Puerto Rico Station**], T. B. McCLELLAND, R. L. DAVIS, and H. C. HENRICKSEN (*Puerto Rico Sta. Rpt. 1932, pp. 4-6, 16, 17, 18, 19, 20, 21, figs. 3*).—Brief mention is made of experiments on the shading of coffee; the vegetative propagation of coffee; breeding and improvement of sweet corn; absorption of ash constituents by citrus trees; control of time of blooming of citrus trees and pineapples; and on the production of bay oil. The accession of seedlings and new forms of pineapple for future breeding work is mentioned.

The response of greenhouse crops to electric light supplementing daylight, L. GREENE, R. B. WITHROW, and M. W. RICHMAN (*Indiana Sta. Bul. 366 (1932), pp. 20, figs. 12*).—That many ornamental plants flower earlier and more profusely when supplied with supplemental illumination was indicated in studies extending over a 2-year period and involving many species. High intensity illumination was not found essential or even beneficial with most plants; in fact the light from 50- and 100-w lamps placed 50 in. above the bench produced almost as favorable results as did much higher intensities. A relatively long period of low intensity illumination was found much more favorable in the production of earlier and more abundant flowering than were higher intensities for shorter periods. The time of night during which the additional light was supplied was often a factor but not to an extent requiring the use of specific treatments. Ultraviolet light in wave lengths shorter than those of the solar spectrum was found harmful to plants.

The variable results obtained with different species indicated that the most favorable conditions of lighting should be determined for each species and in many cases for each variety. For example, some plants illuminated only during the early seedling stage flowered as soon as others illuminated during their entire life. On the other hand, certain plants responded most favorably to illumination applied at a more mature stage.

Supplemental light made possible the production of an early spring crop of asters. Pansies and calendulas responded very favorably when illuminated with a 100-w lamp for 10 hours each night during the entire life of the plants. Easter lily (*Lilium giganteum*) flowered earliest when irradiated for the first

20 days after appearing above the soil with a 500-w lamp for 5 hours each night.

Carbon dioxid storage, III, IV, N. C. THORNTON (*Amer. Jour. Bot.*, 19 (1932), No. 10, pp. 843, 844).—Two studies are reported from the Boyce Thompson Institute for Plant Research.

III. *The influence of carbon dioxid on the oxygen uptake by fruits and vegetables* (p. 843).—It was found that when stored in 55 to 65 percent carbon dioxide with 20 percent oxygen dormant and nondormant potato tissues took up 83 and 239 percent more oxygen, respectively, onion bulbs 89 percent, tulip bulbs 11 percent, and beet roots 95 percent. On the other hand asparagus shoots, banana fruits, strawberry fruits, and shelled lima beans took up, respectively, 33, 17, 17, and 34 percent less oxygen. Within the range 8 to 72 percent of carbon dioxide there was no definite change in oxygen uptake of carrot roots. The duration of the exposure was an important factor.

IV. *The influence of carbon dioxid on the acidity of fruits and vegetables* (pp. 843, 844).—Storage in carbon dioxide resulted in an increase in alkalinity in the juices of plant tissues, the reduction in acidity increasing with the concentration of carbon dioxide and with the prolongation of the storage period. In the absence of oxygen the change in pH was not toward alkalinity but in the direction of increased acidity.

[**Vegetable crops at the New York Cornell Station**] (*New York Cornell Sta. Rpt. 1932*, pp. 160–162, 164–166).—Brief notes are made on the progress of studies of the premature seeding of celery; on fertilizer experiments with asparagus; on the use of green manures and cover crops in vegetable culture; on the selection and breeding of sweet corn to reduce or eliminate suckers; on fertilizer studies with muck soil crops; on the handling and storage of vegetables; and on place effect influences in seed beans.

Grading, packing, and stowing Florida produce, M. R. ENSIGN (*Florida Sta. Bul. 254* (1932), pp. 59, figs. 29).—Of the 10 leading truck crops, string beans, cabbage, celery, cucumbers, eggplants, peppers, lettuce, white potatoes, tomatoes, and watermelons, only 3, namely, string beans, cabbage, and peppers, showed a favorable upward trend in production in the period from 1925 to 1931. The crop showing the greatest decline was lettuce, due primarily to an inability to grow the Iceberg variety successfully.

An analysis of causes of the present situation suggested that the use of the bulge pack is a potent factor. Not only do growers lose on the excess quantity put into overfilled containers, but the consequent damage to the produce and package opens the way for discounted prices, recooperage charges, and large damage claims, the last of which is chiefly of benefit to receivers and shippers. Breakage of containers in transit due to their inferior construction or to poor nailing and assembling was found excessive, and loose stowing and lack of correct bracing in the car adds greatly to the losses.

Various types of strong, light, and easily handled packages that display contents advantageously are described and illustrated. The proper methods of packing vegetables in these containers and of stowing containers in cars are pointed out, with the added suggestion that a strict adherence to the loading rules as specified in the Dulaney tariff, both as to assembling and nailing of the containers and to stowing and bracing of the load, would effectively reduce wastes.

Appended are the official United States and Florida standards for the grading of the principal fruits and vegetables.

Puerto Rico truck crops for exportation [trans. title], L. A. SERRANO (*Puerto Rico Dept. Agr. and Com. Sta. Circ. 100* (1932), Spanish ed., pp. 10).—Information is presented on the volume and value of exports, the species and

varieties grown, time of planting, culture, important insects and diseases and their control, cost of production, etc.

Anatomy of Phaseolus vulgaris L. var. Black Valentine, M. T. DOUTT (*Michigan Sta. Tech. Bul. 128 (1932), pp. 31, pls. 8*).—Accompanied by photomicrographs and drawings, there are presented the results of studies of the gross morphology, anatomy, ontogeny, and the course of the vascular bundles in a horticultural variety of the cultivated garden bean.

Commercial cabbage culture, V. R. BOSWELL (*U.S. Dept. Agr. Circ. 252 (1933), pp. 59, figs. 21*).—Designed primarily to present a few typical practices, together with some less commonly known information and principles which underlie successful production, this circular discusses among other points the effects of temperature, characterizations of the more important varieties, seed, soil preparation, culture in various important producing areas, harvesting, storing, grading, and pest control. The section on insects was prepared with the assistance of W. H. White and that on plant diseases by J. C. Walker.

Results of experimental work on the growing of cucumbers in electrically heated soil, J. R. TAVERNETTI and H. A. JONES (*California Sta., Calif. Com. Relat. Elect. Agr., Prog. Rpt. 20 (1933), pp. 10, figs. 9*).—Presented as a joint contribution of the station and the California Committee on the Relation of Electricity to Agriculture, this mimeographed report states that attempts to grow cucumbers during the winter months in muslin covered frames heated by electricity were unsuccessful because of the low air temperature. Soil heating both in frames and in the field in the spring tended to hasten maturity but not to an economically important degree. In two tests the proportion of first grade cucumbers was increased, in one instance decreased, and in one case equaled by soil heating. Seed germinated faster and the plants grew more rapidly in the heated beds.

Growing and marketing muskmelons, J. W. LLOYD (*Illinois Sta. Circ. 405 (1933), pp. 20, figs. 6*).—Replacing Bulletin 124 and Circular 139 (E.S.R., 20, p. 146; 23, p. 42), general information is presented on culture, control of pests, varieties, harvesting, marketing, etc.

The effect of certain mineral elements on the color and thickness of onion scales, J. E. KNOTT (*New York Cornell Sta. Bul. 552 (1933), pp. 14, pls. 2*).—Observing that many areas of muck soil in New York produce onions of poor color and with thin scales, experiments were conducted in the greenhouse with soils obtained from locations producing, respectively, well and poorly colored onions. Analyses showed 19.53 percent ash and 31 p.p.m. of copper in the soil producing well colored onions and 14.9 percent ash and 12.5 p.p.m. of copper in that producing poorly colored bulbs. A total of four crops, two of Ebenezer sets and two of Yellow Globe Danvers seed, were grown. Scale thickness was increased and color enhanced in the first two crops by increased quantities of superphosphate. In the second crop onions receiving a total of 200 lb. per acre of copper sulfate produced the thickest scales and the best color. The same situation obtained with the seeded crops.

In 1930 field trials in Orange County in which copper sulfate and manganoous sulfate were applied at the rate of 100 lb. per acre, the former had a slight effect on color and the latter none. In 1931 where muriate of potash and superphosphate were used in heavy quantities on a recently cleared muck, the color was best where phosphoric acid was applied. No evidence was seen that potash improved color over that produced by the basic fertilizer. From these results and those obtained in the greenhouse the author suggests the possibility of improving scale color and thickness by the use of large amounts of superphosphate. It is believed that the fertilizer applications

commonly used do not provide sufficient phosphorus to influence the color of onions on mucks where color is deficient.

In field experiments in 1932 the application of 100 lb. per acre of monohydrate copper sulfate gave a significant increase in scale thickness. In 11 of 18 trials, 200 lb. per acre further increased scale thickness, but none of four plats receiving 300 lb. per acre showed a significant increase above the 200-lb. plats. Onions grown on soil supplied with copper were firmer than those not so treated. The effect of copper on scale color was equally as striking as that on thickness. The response in both thickness and color of scales indicated an interaction between the causal factors, among which water is conceded important.

Seed of selfed bulbs of good and poor color growing on muck where color was only fair produced uniformly poorly colored bulbs when sown on a soil normally producing poorly colored onions. A test of a number of varieties and strains on both good and poor coloring soils further suggested that inferior color is an environmental rather than a genetic reaction.

Spinach early and late, J. W. LLOYD (*Illinois Sta. Circ. 404* (1933), pp. 8, figs. 5).—General information is presented on the culture and handling of spinach, including the New Zealand type.

The composition of canning tomatoes, L. G. SAYWELL and W. V. CRUESS (*California Sta. Bul. 545* (1932), pp. 32, fig. 1).—Working with tomatoes procured from four regions differing widely in prevailing summer temperatures and humidity, it was found that fruits from the cool, foggy climate of the San Francisco Bay region were considerably higher in total solids than those grown in warmer localities; in fact, in general the higher the average summer temperature the lower the total solids. The average total solids content of all samples from southern California for a 5-year period was 0.55 percent lower than that of northern California samples.

Based on published data, California tomatoes appeared to be higher in total solids than those grown in the eastern United States. November ripened tomatoes were lower in total solids than those maturing in October and September, and in most seasons total solids were somewhat higher in the October pickings than in the September. That soil moisture was also a factor was shown in higher total solids in fruit from plants suffering from a lack of water.

Among varieties, Stone was consistently higher in total solids and total acids, and Early Canner was also high in total solids. Seed selection within a variety yielded strains differing in composition of fruit, and in fact fruits from adjacent plants or from different locations on a single plant varied considerably.

Analyses of the different parts of a fruit showed the locular tissues to be higher in total acid and slightly lower in total solids, reducing sugars, and proteins than the cores and walls. The cores were the highest in total solids and reducing sugars. The acid-hydrolyzable material was much lower in the locules than in the walls and cores. The average protein content of samples from 3 years' collections was 0.97 percent. Less than 0.05 percent of the sugars which constituted about half the total solids was sucrose, and the starch content of the pulp was also very low. Pectin content varied considerably with variety, time of picking, locality, and degree of ripeness. The average pH value of the 1925 samples was 4.1, the range being mostly between 4 and 4.2.

[Pomology at the New York Cornell Station] (*New York Cornell Sta. Rpt. 1932*, pp. 114, 150–152).—Brief comments are given on the results of studies in

pruning; orchard soil management; apple pollination; the nature and cause of winter injury to fruit tree roots; the effect of water-logged soils on photosynthetic activity; the relation of storage temperature to the keeping of apples; the comparative efficiency of oiled wrappers and shredded paper in the control of apple scald; the development of red color in apples after harvesting; and, by A. G. Rodriguez, on the influence of smoke and ethylene on the fruiting of the pineapple.

Field studies of bud sports in Michigan tree fruits, B. D. DRAIN (*Michigan Sta. Tech. Bul. 130 (1932), pp. 48, figs. 18*).—As part of a general program to determine the types, frequency, and importance of bud variations in deciduous tree fruits, the author presents the results of an intensive search of Michigan orchards in which were discovered many variant types, particularly among apples and sour cherries. Many of these off types are described.

As the work progressed, evidence was found that such variations are rather common instead of rare, although more off types were found in some varieties than in others. The numbers corresponded rather closely to the total number of trees observed and the time spent in studying them. Certain of the variants differed from the parent in only one character, such as color of the fruit, while others differed in two or more characters, such as season of ripening, habit of tree growth, etc. It was apparent that bud sports extend to most, if not all, of the characters of the tree and fruit. There was observed a tendency for certain types of variations to be associated with certain others; for example, gigantism in the fruit of the apple was associated with a distinctly spreading habit of tree.

No evidence was found that environment plays a role in the development of bud variations. Some, such as color mutations in apples, were rather obviously sectorial chimeras. Others, such as in the case of one russeted pear, might be classified as periclinal, mottled, or mosaic type chimeras, and still others did not fall in either group.

Viewed from the standpoint of actual value, a large percentage of the bud sports were of little or no merit, while some, especially red fruited mutations, appeared highly valuable. However, because asexual propagation is employed in fruit tree production the practice of selecting buds from trees of known characteristics and performance is obviously desirable, since such choice tends to eliminate worthless and undesirable variations and promotes uniformity within any given variety.

Deciduous-fruit improvement through tree-performance records, A. D. SHAMEL and C. S. POMEROY (*U.S. Dept. Agr., Farmers' Bul. 1696 (1933), pp. II+18, figs. 9*).—Stating that investigations of extensive plantings of young peaches, pears, prunes, and apricots have shown that the frequently occurring off type trees are often the results of unintentional propagation of limb variations in the parental trees, the authors classify such variations as fluctuations due to environment and as true variations which persist and may be propagated. Examples of the permanent type of variations found in apple, pear, peach, and plum orchards are illustrated and discussed, and a method of discovering such variations by use of individual tree records is described in considerable detail. Striking variations, such as color mutations and changes in the type of foliage, may be determined by careful inspection of the trees. The heritability of variations may be established by top-working in older trees or by budding of young nursery stock. The use of buds from vigorous, high yielding trees bearing fruits of desirable type is said to have given excellent results with citrus and should prove equally valuable with deciduous fruits.

Soils in relation to fruit growing in New York.—II, Size, production, and rooting habit of apple trees on different soil types in the Hilton and

Morton areas, Monroe County, J. OSKAMP and L. P. BATJER (*New York Cornell Sta. Bul.* 550 (1932), pp. 45, figs. 42).—This, the second phase (E.S.R., 68, p. 591) of a study upon the relation of soil to fruit growing, presents the results of soil examinations in representative old and young Baldwin orchards and leads to the conclusion that a definite relationship exists between stand, yield, size, vigor, and rooting habit of Baldwin trees and the drainage conditions as expressed by a study of the soil profile relative to color, texture, structure, percolation, and ground water. The highest yields and generally most satisfactory conditions were found in orchards located on soils of a uniform brown to slightly mottled profile without marked contrasts between horizons. Such soils were usually medium to light in texture and underlain with deep subsoils, which permitted a ready downward movement of water. On the other hand, unproductive orchards were usually located on below medium to heavy soils underlain with a slow-draining subsoil at 2 ft. or less from the surface. The most unfavorable orchard location seemed to be where shallow rooting was accompanied by a high ground water level or by a high ground water level in connection with a gravelly till substratum.

Roots of mature Baldwin apple trees penetrated from 2.5 to 8.5 ft., depending on the character of the subsoil. In all of the soils studied about 60 to 70 percent or more of the roots were in the upper 16 in. That the deeper roots were important factors is indicated by the fact that practically all of the deep rooted orchards were productive.

Relation of leaf area and position to quality of fruit and to bud differentiation in apples, M. H. HALLER and J. R. MAGNESS (*U.S. Dept. Agr., Tech. Bul.* 338 (1933), pp. 36, pl. 1, figs. 8).—Asserting that the supply of carbohydrates available to the fruit depends primarily on the amount of carbohydrates elaborated per fruit and on the transport of carbohydrates to the fruit, the authors present the results of experiments with apples grown on both ringed and unringed branches supplied with different leaf areas per apple and with a given leaf area at different distances and in different directions from the fruit.

In general on unringed branches variations in leaf area had no appreciable effect on the composition of the fruit and very little influence on size.

On ringed branches on the other hand, increased leaf area was accompanied by increased fruit size. However, even with small leaf areas the increased fruit size was not proportional to the leaf increase. Maximum fruit size was usually obtained with about 30 leaves per fruit. With relation to leaf location, apples apparently secured elaborated foods with equal facility from leaves above or below, or even on separate branches. Practically no reduction in size or composition of the fruit occurred when all leaves were removed to a distance of 4.5 ft. in Grimes Golden, 6 in Ben Davis and York Imperial, 6.5 in Jonathan, and 10 ft. in Baldwin, as compared with fruits grown with the same number of leaves immediately adjacent.

As regards composition, the percentage of dry weight and of total sugars increased in fruit of ringed branches with increased leaf area. Good dessert quality was associated with high total sugars. Color, both ground and overlying, was inferior in fruits with a small number of attendant leaves. In Ben Davis firmness after storage decreased with an increase in leaf area per apple, and in Baldwin, Jonathan, and York Imperial apples decreased in firmness with increased leaf area up to about 20 leaves, but above this point firmness increased with increased leafage.

Blossom bud formation was inhibited on ringed branches with few leaves but occurred freely with larger leaf areas. Blossom bud formation was associated

with a relatively high sugar content in the adjacent apples. Thinning treatments as late as June 25 greatly influenced blossom bud formation.

Factors causing cull apples in Missouri, G. C. SCHOWENGERDT and D. C. WEST (*Missouri Sta. Bul.* 319 (1932), pp. 30, figs. 9).—Investigations conducted in representative orchards in southwestern and northwestern Missouri showed that small size of fruit was the leading cause of low grade apples in both areas in 1928 and 1929. Among other important factors concerned were mechanical injuries, insufficient color, injuries from codling moth, curculio, aphids, scab, blotch, and cedar rust, and sprays. In certain seasons hail and frost also caused losses.

As concerns locality, in 1928 most of the varieties of apples studied graded out somewhat better in southwestern than in northwestern Missouri. In 1929 the situation was reversed, with far better fruit in the northwestern section. In both years a higher price was obtained for all grades of apples in the northwestern area. In general Grimes Golden and Jonathan commanded the best prices.

Ways and means of overcoming most of the major factors lowering the grade of apples are discussed.

Relation of growth cycle to toxicity of wound dressings, J. S. COOLEY and J. H. CRENSHAW (*Amer. Jour. Bot.*, 19 (1932), No. 10, pp. 842, 843).—Working in the Hood River Valley, Oreg., there was noted a very pronounced killing of apple tissues in the autumn by very mild wound dressings which in the spring caused only slight or no injury to the same type of wounds. This demonstrated a close relationship between resistance to toxic dressings and the vital processes in the plant.

Correlation of specific heat and percentage of water in apple wood, A. L. STARK (*Plant Physiol.*, 8 (1933), No. 1, pp. 168-170, fig. 1).—Studies at the Iowa Experiment Station upon 15 apple varieties showed that the specific heat of the wood may be calculated directly from the water content. From 65 observations on current season apple shoots collected at intervals in the period May to December 1931, there was determined a correlation of $+0.9475$ between specific heat and percentage of water in the wood. A scale showing the relation of specific heat and the percentage of water is presented.

Preparing apples for market in barrels and baskets, R. R. PAILTHORP and J. W. PARK (*U.S. Dept. Agr., Farmers' Bul.* 1695 (1933), pp. [2]+34, figs. 26).—This bulletin, a revision of and superseding Farmers' Bulletin 1080 (E.S.R., 42, p. 39), presents information on harvesting, grading, packing, transportation, cold storage, etc.

The Babcock peach, G. P. WELDON and J. W. LESLEY (*California Sta. Circ.* 328 (1933), pp. 5, figs. 2).—This new peach, a second generation hybrid from an original cross between the Strawberry, a variety extremely subject to prolonged dormancy, and a variety of the Peento group, much less susceptible to this trouble, is described and discussed. The new peach combines resistance to delayed foliation and some of the desirable qualities of the better types of peaches.

The Fertile Hale peach, S. JOHNSTON (*Michigan Sta. Quart. Bul.*, 15 (1933), No. 3, pp. 181, 182).—A description is presented of a self-fruitful and vigorous peach found among a shipment of J. H. Hale trees received from a commercial nursery. The fruit resembles J. H. Hale very closely but ripens some three days later and is not as bright in appearance. The quality is considered very good.

Seasonal absorption of nutrient salts by the French prune grown in solution cultures, H. L. COLBY (*Plant Physiol.*, 8 (1933), No. 1, pp. 1-34, figs. 8).—In this study at the California Experiment Station there was determined

the course of seasonal nitrate absorption and of elemental starvation in 1- and 2-year-old French prune trees growing in water cultures in the greenhouse. In 1929 the primary peak in nitrate absorption in complete nutrient solution trees occurred near the end of June, with a final secondary peak in late October, followed by a rapid decline to winter rest. In 1930 the maximum was reached at about the same season. Potassium absorption closely followed nitrate, except for a slight lag in the early part of the season. The rate of nitrate and potash absorption was closely associated with temperature and probably also with light intensity.

Of the six major elements other than nitrogen in the solution, namely, sulfur, iron, potassium, magnesium, phosphorus, and calcium, sulfate starvation apparently exerted by far the least depressing effect on nitrate absorption. Iron starvation was not studied. Potassium, magnesium, and phosphorus starvation all seriously depressed nitrate absorption, even to the extent of a loss of nitrate from the roots in the late season. Calcium starvation prevented root growth altogether, although roots previously well stocked with calcium survived somewhat longer. The total phosphate absorption for the season was far more depressed by magnesium starvation than by a lack of potassium or sulfur. Calcium starvation apparently prevented the absorption of any considerable amount of any ion, including phosphate.

The Potomac raspberry, G. M. DARROW and G. F. WALDO (*U.S. Dept. Agr. Circ. 259 (1933), pp. 4, figs. 2*).—A brief descriptive account is given of a new raspberry originated at the U.S. Plant Field Station near Glenn Dale, Md., from a cross of the Farmer black raspberry and the Newman red raspberry. This new fruit is said to have wide adaptation because of its hardiness and resistance to leaf spot and anthracnose diseases.

The Dorsett, Fairfax, and Narcissa strawberries, G. M. DARROW and G. F. WALDO (*U.S. Dept. Agr. Circ. 257 (1933), pp. 7, figs. 3*).—Accompanied by information on parentage, brief descriptions are given of two new varieties developed at the U.S. Plant Field Station near Glenn Dale, Md. The third variety mentioned, namely, Narcissa, was described in Oregon Experiment Station Circular of Information 79 (E.S.R., 68, p. 621).

Results of strawberry fertilizer and tillage experiments, R. A. LINEBERRY, J. J. SKINNER, H. B. MANN, and C. B. WILLIAMS (*North Carolina Sta. Agron. Inform. Circ. 75 (1933), pp. [3]+26*).—This is a preliminary report of studies conducted at Chadbourn, N.C., during the three seasons ended 1931-32 in cooperation with the U.S.D.A. Bureau of Chemistry and Soils. Among observations were that fertilizer mixtures containing more than 6 percent ammonia gave a comparatively large percentage of faulty and soft berries. Large amounts of potash decreased yields but in many instances improved the quality of the fruit. Considering both yield and quality, a mixture containing 8 percent phosphorus, 6 percent ammonia, and 6 percent potash was most effective. There were indications that physiologically acid fertilizers, such as ammonium sulfate, may be more beneficial to strawberries on neutral or slightly acid soils, and that physiologically alkaline fertilizers, such as nitrate of soda, may be more favorable on very acid soils.

Fredonia, a promising blue grape for early market, N. L. PARTRIDGE (*Michigan Sta. Quart. Bul. 15 (1933), No. 3, p. 183*).—Descriptive comments are made on a new grape originated by the New York State Experiment Station at its Fredonia laboratory from a cross of Champion and Lucile.

Neophytosis of rejuvenescence of nucellar bud seedlings in citrus, W. T. SWINGLE (*Amer. Jour. Bot., 19 (1932), No. 10, p. 839*).—The fact that recently originated ovary-sterile hybrids reproduce almost exactly the original F₁ seed-

lings while old cultivated varieties usually exhibit marked rejuvenescence is explained on the theory that hormones secreted in the embryo sac apparatus force into activity the genes governing embryonal ontogeny.

Physiological anatomy, type, variety, and maturity of citrus fruits as affecting quality of prepared juices, H. P. TRAUB, L. W. GADDUM, A. F. CAMP, and A. L. STAHL (*Plant physiol.*, 8 (1933), No. 1, pp. 35-80, fig. 1).—In this study, conducted cooperatively by the U.S. Department of Agriculture and the Florida Experiment Station, it was found that the cause of the bitter taste developing in prepared citrus juice is of glucosidal origin and is localized primarily in the inner peel, veins, and locular wall tissues. The degree of development was a function of fruit maturity, citrus type and variety, method of preparation, and after treatment. The kind of bitter taste was associated with the nature of the glucoside contained in the specific type of fruit. The causal agent for color changes in prepared citrus juices was identified as citrus oil from the outer peel, and within the limits of the experiments the amount and rate of color changes were to a marked degree proportional to the quantity of citrus oil present.

The tendency of prepared citrus juices to develop bitter flavor was found dependent on the age of the fruit, decreasing with maturity. This fact harmonized with the known decrease in glucoside content of citrus with maturity.

Concerning the stability of the suspension, a reduction in size of suspended particles by grinding, etc., improved stability and lightened the color of the product. In prepared juice part of the suspended particles rose and part settled, but following vacuumization all particles settled. Preliminary results suggested that rates of freezing had a greater effect on stability of the suspension than did variations in storage treatment. Quick freezing and cold storage did not materially affect the rate of movement of the suspended particles as compared to fresh juice. Very large amounts of citrus oil caused all particles to rise.

Asiatic chestnut (*New York Cornell Sta. Rpt. 1932, p. 129*).—Notes are presented on the poor survival of Asiatic chestnuts following planting.

[Floriculture at the New York Cornell Station] (*New York Cornell Sta. Rpt. 1932, pp. 127-129, 143*).—Brief statements are made as to the results of studies on the control of gladiolus thrips; on the effect of aluminum on the color of hydrangea flowers; on photoperiod effects on the blooming of chrysanthemums and other plants; on the value of muslin coverings for such summer annuals as calendulas, asters, and dahlias; on the rooting of evergreen cuttings; on storage of seeds of ornamental woody plants; on fertilizer and planting studies with shade trees; on paper mulching of evergreens; on the use of paraffin for coating balled and burlapped evergreens; and, by M. F. Barrus and H. W. Rankin, on the propagation of the snowberry.

FORESTRY

[Forestry at the Indiana Station] (*Indiana Sta. Rpt. 1932, pp. 41-43, figs. 2*).—Brief reports are given on the progress of studies in the marketing of woodland products, such as crossties and piling, and on the establishment of windbreaks, the effect of which on wind velocity and temperature is presented in tabular form.

[Forestry at the Ohio Station], E. SECREST, O. A. ALDERMAN, B. E. LEETE, E. G. WIESEHUEGEL, R. R. PATON, and F. W. DEAN (*Ohio Sta. Bul. 516 (1933), pp. 113-122, figs. 2*).—Reports are made of work in reforestation; management of the State forests and parks; control of forest fires; forest regeneration;

timber prices in Ohio; classification of forest lands; and the handling of farm woodlots.

Peat mats for germination tests of forest tree seeds, P. C. WAKELEY (*Science*, 76 (1932), No. 1983, pp. 627, 628, fig. 1).—Peat moss compressed into mats or blocks was found in tests conducted by the U.S.D.A. Southern Forest Experiment Station with *Pinus caribaea* seeds to give not only prompter but usually higher final germination than was obtained in sand. Peat moss mats occupied much less space than sand flats, and adequate moisture content was more readily maintained. A description is given of the apparatus.

The effect of forest burning on reproduction [trans. title], N. M. TŪL'PANOV (TŪLPANOFF) (*Trudy Lesotekh. Akad. (Mitt. Forsttech. Akad. Leningrad)*, 38 (1931), No. 1, pp. 50–60; *Ger. abs.*, pp. 59, 60).—Stating that Hofmann's findings (*E.S.R.*, 38, p. 145) on the importance of forest fire in the regeneration of Douglas fir first drew attention to the importance of soil-stored seeds, the author discusses experiments conducted by the Leningrad Forestry Institute in which areas previously seeded with Scotch pine were burned over under conditions which permitted the recording of temperatures of the soil at various depths. In one experiment, where the temperature reached 362° C., 33 percent of the seed showed no external injury and germinated 12 percent. In a second test, where the temperature reached 182°, 95 percent of the seeds was severely injured and the viability was only 0.1 percent.

Hardwood invasion in a comparatively old white pine afforested area, V. A. YOUNG (*Ecology*, 14 (1933), No. 1, pp. 61–69, figs. 4).—A small white pine stand, located near Syracuse, N.Y., and kept free from hardwoods until 1894, was subsequently rapidly invaded by a dense and overpowering growth of hardwoods, which had to be removed in 1931 in order to save the pine. Hardwoods are considered the most destructive biotic enemy of afforested conifer areas in New York State, particularly those stands located on soils not wholly adapted to pine. Small coniferous stands do not provide a sufficiently dense shade to check hardwood invasion.

Forest associations in the uplands of the lower Gulf coastal plain (long-leaf pine belt), L. J. PESSIN (*Ecology*, 14 (1933), No. 1, pp. 1–14, figs. 8).—The conclusion is reached that the forest associations of the region are determined largely by the prevailing edaphic conditions; for example, on sterile, well drained, dry sands, after longleaf pine is removed the typical xerophytic scrub oaks predominate. Some plants are excellent indicators of the moisture condition of the soil; for example, the gopher apple indicates dry soil, while wax-myrtle thrives best on moist soil.

Soil temperatures and evaporation in a paper birch-white pine forest, Long Lake, Hamilton County, New York, H. I. BALDWIN (*Ecology*, 14 (1933), No. 1, p. 75).—Stated as an average of weekly averages, the soil temperature at a 1-ft. depth during the period June 27 to August 28 was 55.7° F. in the woods and 61.8° in the open. Evaporation measured by Livingston atmometers placed 6 in. above the soil was 83.2 cm per week in the open and 34.5 cm in the woods.

[Tree species tested by the Iowa Station], G. B. MACDONALD (*Iowa Sta. Rpt.* 1932, p. 97, fig. 1).—The black locust is discussed with respect to its value in preventing erosion.

Soil erosion and tree planting, E. SECREST (*Ohio Sta. Bimo. Bul.*, 18 (1933), No. 2, pp. 30, 31, figs. 2).—Soil erosion was found to be checked not so much by the roots of trees as by the accumulation of needle litter, which matted closely to the ground, increased the water absorptive capacity of the soil, and at the

same time shed surplus run-off of water. Among species proving best for reclamation were red, white, and Scotch pines in the northern part of the State and shortleaf and pitch pines in the southeastern portion. The black locust proved well adapted for reclaiming eroded limestone soils. Where soils are badly gullied 4-year transplants are conceded most desirable and should be spaced no farther apart than 6 by 6 ft.

Using soil-binding plants to reclaim gullies in the South, H. G. MEGINNIS (*U.S. Dept. Agr., Farmers' Bul. 1697 (1933), pp. II+18, figs. 15*).—Asserting that millions of acres throughout the uplands of the South are eroding at an appalling rate, the author discusses the planting of trees, vines, grasses, and other plants as a means of preventing erosion. The restoration of the forests is deemed the climax process for reclaiming areas denuded by gullying. However, the construction of brush barriers and the planting of rapidly growing plants must usually precede actual reforestation.

Making spruce-fir land profitable, R. H. WESTVELD (*Michigan Sta. Quart. Bul., 15 (1933), No. 3, pp. 172-174*).—Asserting that one of the most destructive forces in cutting operations is carelessness in logging, which destroys large quantities of young growth, the author presents tabulated data on the percentage of seedlings destroyed in logging operations on two typical spruce areas of northern Michigan. The average losses ranged from 57.7 to 95.7 percent. In one operation 39 percent of the surface was covered by logging roads upon which all seedlings were killed. Suggestions for reducing such losses are given.

The economic significance of tree size in western Sierra lumbering, M. R. BRUNDAGE, M. E. KRUEGER, and D. DUNNING (*California Sta. Bul. 549 (1933), pp. 61, figs. 25*).—In cooperation with the U.S.D.A. Forest Service a coordinated logging and milling study was conducted in a typical virgin stand of Site 1, west slope, California pine region timber consisting of sugar pine, ponderosa pine, white fir, and incense cedar trees of all ages and sizes.

Evidence was secured that operators are cutting many trees below a profitable minimum size. The cost of felling, limbing, bucking, yarding, loading, decking, unloading, and sawing increased as the tree diameter decreased, the cumulative effect of these increases becoming so pronounced in the smallest classes that the total of all costs was approximately twice as great for lumber from 14-in. as from 40-in. trees.

In all species lumber from 40-in. trees exceeded production costs when fixed acre charges and stumpage charges were excluded. The average minimum profitable diameters in white fir, incense cedar, sugar pine, and ponderosa pine were 34, 28, 23, and 22 in. in diameter at breast height, respectively. Disregarding species, the average minimum tree diameter cutting limit to give the greatest margin per acre was 28 in.

In conclusion the authors assert that the cutting system for each logging operation must be determined from the stand at hand, the local situation, and the particular objectives of management. The leaving of small trees which can not pay for their handling is a practice which should be universally adopted by lumbermen purely on its merits as an operating economy.

Woodsman's manual, A. CARY (*Cambridge: Harvard Univ. Press, 1932, 4. ed., pp. [X]+366, pls. 3, figs. 75*).—As in the earlier editions (*E.S.R.*, 51, p. 842), herein is presented information on the principles and practices of land surveying, forest mapping, log and wood mensuration, timber estimating, etc.

Logging methods (*California Sta. Rpt. 1932, p. 69*).—The results of studies of logging operations in the redwood and pine regions are briefly discussed.

DISEASES OF PLANTS

[Plant disease studies in California] (*California Sta. Rpt. 1932*, pp. 33-37, 46-49, 56-58, figs. 5).—Data are reported as to findings on black end of pears; little leaf disease of fruit trees; prune die-back; potato virus diseases; pink root of onions; resistance in wheat to bunt, in alfalfa to wilt, and in lima beans to nematodes, wireworms, *Fusarium* rot, and heat; carrot soft rot; cantaloup powdery mildew; potato calico; diamond canker of the French prune; crown rot and blight of walnuts; fig diseases; sun blotch of avocado; and decline disease of dates.

[Plant disease studies in Delaware] (*Delaware Sta. Bul. 179 (1932)*, pp. 43-55, figs. 2).—Data are briefly noted on control of tomato seedling diseases, soil disinfectants for control of black rot and other sweetpotato seed bed troubles, and relation of the periodical cicada to dissemination of peach yellows and little peach, all by T. F. Manns, and diseases of canteloups and soybeans, bacterial spot of stone fruits, spray materials, and a root infection of strawberry plants, all by J. F. Adams.

[Plant disease studies by the Georgia Coastal Plain Station] (*Georgia Coastal Plain Sta. Bul. 19 (1932)*, pp. 62, 63, 65, 66, 93-97, fig. 1).—Data are briefly reported as to findings from spraying for nail head blight (*Alternaria solani*) of tomatoes and for downy mildew of canteloups and from root knot of tobacco, downy mildew (blue mold), and other tobacco diseases.

[Plant disease studies in Indiana] (*Indiana Sta. Rpt. 1932*, pp. 25-28, 55, 56, figs. 2).—Findings are briefly reported as to developing resistance to bacterial wilt disease in sweet corn; clover mildew investigations; bacterial canker of tomato; effect of leaf rust on yield, quality, and chemical composition of winter wheat; the relation of appressorium formation and host penetration by leaf rust of wheat to stomatal aperture; cereal scab investigations; tomato virus diseases; and apple blotch.

[Plant disease studies in Iowa] (*Iowa Sta. Rpt. 1932*, pp. 32-40, 42-45, fig. 1).—Results are briefly reported of work on inheritance of resistance to *Basisporium* ear rot and seed rotting and the relation of these characters to yield, by C. S. Reddy and E. W. Lindstrom; biology and control of *Colletotrichum lagenarium* on species of Cucurbitaceae, by D. V. Layton; breeding and selection of resistant strains of melons, by J. J. Wilson; physiological specialization and parasitism of crown rust of oats, and the making of new strains of oats resistant to crown rust by selection and hybridization, both by H. C. Murphy; the control of seed and soil-borne diseases of the potato, by Reddy; pathogenicity, host response, and control of leaf spot of sugar beets, by E. F. Vestal; breeding of sugar beet strains resistant to *Cercospora* leaf spot, host range, and intertransmissibility of species of *Cercospora*, by S. M. Dietz; diseases of sugar beets caused by species of *Phoma*, *Rhizoctonia*, *Pythium*, etc., in their relation to the *Cercospora* leaf spot disease, by Reddy; breeding for resistance to cabbage yellows, by Wilson; development and testing of dust fungicides for control of seed-borne diseases of wheat and oats, by Reddy; classification of plant viruses, by R. H. Porter; propagation of disease-free sweetpotato seed stock, by Layton; the pathogenicity and morphology of the genus *Gymnosporangium* in Iowa, and the control of nursery diseases, both by G. L. McNew; onion bulb rot and yellow dwarf, by I. E. Melhus and W. J. Henderson; factors influencing resistance of strains of corn to *Ustilago zaeae*, by Melhus and G. N. Davis; *Diplodia* dry rot of corn and its treatment, by Melhus and Reddy; and pathogenicity of *B. gallarum* to corn, by Reddy.

[Plant disease studies by the New York Cornell Station] (*New York Cornell Sta. Rpt. 1932*, pp. 113, 114, 131-149, 152).—Results are briefly noted of

studies by D. Reddick on the transmission of the virus of bean mosaic by pollen and diseases of wild potatoes in Mexico; by Reddick, W. F. Crosier, and W. D. Mills on blight immune potato hybrids; by C. G. Small on dusting for the control of fruit diseases; by F. M. Blodgett et al. on factors affecting the efficiency of spraying and dusting operations with potatoes and treatment of seed potatoes with mercury compounds, control of potato scab, and virus diseases of the potato; by C. Chupp and G. F. MacLeod on spraying and dusting cucumbers; by Mills on apple scab; by A. G. Newhall et al. on attack of onions by the bulb nematode (*Tylenchus dipsaci*); by Newhall on the development of a forcing-house tomato resistant to *Cladosporium* leaf mold and lettuce tipburn; by G. R. Townsend on control of bottom rot of lettuce; by W. W. Stuart on downy mildew of lettuce; by A. L. Harrison on celery blights; by Newhall on *Phoma* root rot of celery; by D. S. Welch on activities of microorganisms in living trees; by F. L. Drayton on the sexual function of the microconidia in *Sclerotinia gladioli*; by F. Dickson on *S. sclerotiorum*; by H. H. Whetzel and Drayton on *Botrytis* rhizome rot of iris; by L. M. Massey on *C. cyclaminis* n.sp., the causal fungus of the stunt disease of cyclamen; by Welch on a canker disease of basswood and other deciduous trees; by D. K. O'Leary on diseases of lilies; by C. E. F. Guterman and W. H. Burkholder on bacterial leaf spot of carnations and ivy; by Guterman on control of *Botrytis* blight of calendula and snapdragon and control of soft rot and root rot of the calla lily; by F. A. Haasis and F. Weiss on mosaic and "fire" of narcissus; by D. L. Gill on a leaf nematode disease of begonia and a cutting rot of geraniums; by M. F. Barrus and H. W. Rankin on anthracnose of snowberry and seed treatment of Alpha barley to control loose smut; by Burkholder and J. W. Sinden on the physiology of the alpha, beta, and gamma races of *Colletotrichum lindemuthianum*; by A. B. Burrell on cork disease of apple; by Burkholder and K. Zaleski on varietal susceptibility of beans to *Phytomonas medicaginis phaseolicola*; by Chupp on drought injury to cabbage; by F. M. Clara on *Pseudomonas utiformica* n.sp. as the causal organism of a new bacterial disease of pears; by Mills on leaf rust of raspberries caused by *Pucciniastrum americanum*; by Mills and W. E. Blauvelt on fruit scald and leaf scorch; by B. Parsons and Massey on control of rose diseases; and blue mold injury to apples.

[Plant disease studies in Ohio] (*Ohio Sta. Bul.* 516 (1933), pp. 37-42, 43-45, fig. 1).—Data are reported on sulfur sprays for apple scab, by H. C. Young and H. F. Winter; colloidal sulfur toxicity and its enhancement, by Winter and Young; diseases of coniferous seedlings, by C. May; control of leaf spot and blight of carrots, by J. D. Wilson; control of gladiolus scab, by P. E. Tilford; use of formaldehyde dust in tobacco seed beds, by L. J. Alexander; Dutch elm disease, by May; potato spraying with Bordeaux mixture, by Tilford; use of formaldehyde dust in improving the stand of vegetables, by Wilson; chemical treatment of fire blight cankers, by R. C. Thomas; control of raspberry virus disease, by Winter; resistance of celery varieties to yellows, by Wilson; influence of Bordeaux and oil sprays on the water relations of plants, by Wilson and H. A. Runnels; and determination of the phenol coefficients of bactericides, by Thomas.

Biologic forms of *Albugo candida* (Pers.) Kuntze on some cruciferous plants, M. HIURA (*Japan. Jour. Bot.*, 5 (1930), No. 1, pp. 1-20).—In studies carried out in 1928 regarding the existence of biologic forms in *A. candida*, the fungi occurring on radish (*Raphanus sativus*), on aburana (*Brassica chinensis*), and on Chinese mustard (*B. juncea*) were inoculated onto cruciferous plant varieties named.

It is claimed to have been shown that the *A. candida* from *R. sativus* can infect all the radish varieties tested, but that no other crucifer tested was so

infected; that the fungus infecting *B. chinensis* can infect with different degrees of severity *B. japonica*, *B. chinensis komatsuna*, *B. rapa*, *B. chinensis amplexicaulis*, *B. pekinensis*, *B. juncea*, and the original host; and that the fungus on Chinese mustard (*B. juncea*) can infect *B. cernua*, *B. chinensis*, and its original host with different degrees of severity, but not radish. It is therefrom concluded that these three fungi are distinct biologic strains of *A. candida*.

No marked differences in conidial-size have been noted among the fungi attacking respectively radish, aburana, and takana (Chinese mustard), but the form on shepherd's purse (*Capsella bursapastoris auriculata*) bears smaller conidia. The incubation period ranged ordinarily from 7 to 10 days, but from 1 to 2 days longer in less susceptible varieties.

Experiments with *Bacterium tumefaciens* [trans. title], T. H. THUNG (*Tijdschr. Plantenziekten*, 35 (1929), No. 10, pp. 263-269, pl. 1; *Eng. abs.*, p. 268).—Inoculations of celery roots with *B. tumefaciens* resulted in the formation of abortive leaves and roots, probably only on the galls which formed.

The question as to the possibility of artificial immunization of plants was not settled by the experimentation here reported. Results of tests with *Ricinus communis* and *B. tumefaciens* were also negative.

No toxin similar to that of *B. tumefaciens* for plants was obtained from bouillon cultures kept for 3, 8, 14, or 28 days.

"Cultures of *B. tumefaciens* which are ultra-pure in the sense of d'Hérelle may produce tumors in plants. This is contradictory to d'Hérelle and Peyre's hypothesis on the formation of galls. The writer favors Magrou's hypothesis on gall-formation as a consequence of the action of mitogenetic rays, radiated by *B. tumefaciens*."

The life history and physiology of *Synchytrium fulgens* Schroet., with special reference to its sexuality, S. KUSANO (*Japan. Jour. Bot.*, 5 (1930), No. 1, pp. 35-132, figs. 19).—As a result of a study bearing upon the old question whether sexual reproduction occurs in *S. fulgens*, the author contends that it does take place. The processes concerned or related are set forth in some detail.

Effects of certain environmental factors on stripe disease of barley and the control of the disease by seed treatment, R. W. LEUKEL, J. G. DICKSON, and A. G. JOHNSON (*U.S. Dept. Agr., Tech. Bul.* 341 (1933), pp. 40).—Certain phases of the nature of stripe disease of barley caused by *Helminthosporium gramineum*, the effect of environmental conditions on its development, and its control by seed treatment were studied in cooperation with the Wisconsin Experiment Station.

Kernels of healthy heads become inoculated by spores blown from nearby diseased plants. Natural inoculation of kernels in the field by wind-borne spores may occur for some time after flowering. While under some conditions spores on the outside of the seed may produce infection in the seedling, dormant mycelium between the glume and the seed pericarp is considered the principal means of the fungus living over from one crop to another.

Removing the glumes from naturally inoculated kernels before sowing had no effect on the percentage of stripe-diseased plants. Spores from dried barley leaves kept in the laboratory at Arlington, Va., did not germinate after 4 months. The longevity of the conidia seems to depend upon conditions of temperature and humidity during storage. Dormant mycelium in the seed was observed to remain viable for at least five years.

Increased soil fertility or other conditions favoring vigorous plant growth, according to observations, apparently decreases the percentage of diseased

plants from naturally inoculated seed. Growing temperatures of 15° C. (59° F.) or lower and relatively dry soil from planting to emergence favored the development of the disease in plants from naturally inoculated seed, while it was inhibited by high soil temperatures and very wet soil during this period.

In stripe-disease control experiments during the period 1926-30, tests of more than 75 fungicidal dusts showed the effectiveness of the dust fungicides used to be independent of soil reaction and, in general, of soil moisture. Relatively dry soil during emergence reduced the effectiveness of many of the seed treatments. Although the ordinary wet formaldehyde treatment controls stripe disease satisfactorily, formaldehyde dusts were found ineffective.

Observations on *Rhynchosporium secalis* (Oud.) Davis, leaf blotch of barley and rye, F. T. BROOKS (*New Phytol.*, 27 (1928), No. 4, pp. 215-219, pl. 1, figs. 3).—Barley and rye leaf blotch (*R. secalis*) is said to be common near Cambridge, England, chiefly in late winter and early spring. It also attacks wild grasses.

It is stated that even the most susceptible types of barley grow away from the fungus in the spring so as rarely to present infection of the later formed leaves.

The peculiar method of spore formation in *R. secalis* on the host is described. Inoculation experiments show that both leaf surfaces may be infected without causing injury.

Origin of physiologic forms of *Puccinia graminis* through hybridization and mutation, E. C. STAKMAN, M. N. LEVINE, and R. U. COTTER (*Sci. Agr.*, 10 (1930), No. 11, pp. 707-720).—To test the view that physiologic forms and varieties of the cereal rusts arise through hybridization, reciprocal crosses were made between *P. graminis tritici* and *P. graminis secalis* and between *P. graminis tritici* and *P. graminis agrostidis*. From a single aecial cup resulting from the intermixing pycnial nectar of *tritici* × *agrostidis*, eight physiologic forms of *P. graminis tritici* were isolated, some of these not having been identified previously. Two forms resulting from *secalis* × *tritici* crosses proved less virulent on the differential wheat varieties than the *tritici* parent, though one of them inherited from its *secalis* parent the ability to infect slightly the rye differentials. In a uredinial culture of *P. graminis tritici* form 1, collected in 1915 and constant pathogenically for over 13 years, four forms of *P. graminis tritici* appeared successively, two of which were unknown previously. The mutants are said to have been consistent pathogenically during several uredinial generations on the wheat differentials.

“These results, and those of other investigators, indicate that varieties and physiologic forms of *P. graminis* may be considered as dikaryotic clones that remain constant in the uredinial stage, except for mutation. They may, however, lose their identity in passing through the barberry because of segregation in the promycelia of the teliospores, or because of the initiation of a new dikaryophase in the pycnia or aecia. Because of the fact, therefore, that the barberry may be the breeding ground for new and possibly dangerous forms of stem rust, the results from a practical standpoint constitute an additional argument for barberry eradication.”

A preliminary study on the hybridization of physiologic forms of *Puccinia graminis tritici*, M. NEWTON, T. JOHNSON, and A. M. BROWN (*Sci. Agr.*, 10 (1930), No. 11, pp. 721-731, figs. 4).—When crosses were made between physiologic forms of wheat rust, *P. graminis tritici*, the hybrid forms were different from the parental forms in all cases but one, some being new, some identical with previously known forms. By selfing it was discovered that most forms were heterozygous. At least one, form 9, was homozygous. In 95 percent

of the aecia studied, not more than one physiologic form was obtained from each individual aecium.

A study of the inheritance of spore colour and pathogenicity in crosses between physiologic forms of *Puccinia graminis tritici*, M. NEWTON, T. JOHNSON, and A. M. BROWN (*Sci. Agr.*, 10 (1930), No. 12, pp. 775-798, figs. 8).—As a result of a study which has been made on the inheritance of color and the pathogenicity characters in crosses between physiologic forms of *P. graminis tritici* of abnormal color described as arising in work previously noted (E.S.R., 61, p. 237), it is stated that there appears to be an association between color and pathogenicity in some forms of the second generations of the crosses 36 (grayish-brown) × 9a (orange) and 9 (red) × 15 (red).

Observations and researches on resistance to rust of the higher internodes in wheat [trans. title], A. DRAGHETTI (*Ann. R. Staz. Sper. Agr. Modena*, n. ser., 1 (1927-1929), pp. 69-121, pls. 3).—This gives mainly the details of a study of rust resistance under different conditions in the upper parts of different wheat varieties derived largely as the result of hybridization. Compactness of head and length of host internode were among the several features tested in connection with susceptibility to smut. The results are largely tabulated, with discussion.

Relation of weather to the prevalence of wheat stem rust in Nebraska, G. L. PELTIER (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 1, pp. 59-73).—Study at the Nebraska Experiment Station of the time and length of the fruiting period of wheat in the period 1903-1930 showed that epidemics of stem rust (*Puccinia graminis tritici*) (E.S.R., 58, p. 44) did not occur in eastern Nebraska when winter wheat headed before or during the first week in June and ripened before July 1. These years might be classed as rust escaping. While rust epidemics occurred during occasional years within the period they were not always correlated with an extended fruiting period, since during other years with fruiting periods of the same length little or no rust developed.

Intensive studies from 1921 to 1930 of several factors influencing the development of stem rust led to the conclusion that a rust epidemic is possible in the winter wheat area of Nebraska only when a certain combination of factors is present in sequence. These factors comprise a large amount of initial inoculum, reaching the State when conditions favor maximum infection, and the subsequent production of large numbers of primary uredia over a large area; winter wheat entering the heading stage June 1 to 7, or thereafter, with primary uredia appearing at about the same time; and an extended fruiting period, during which optimum temperature, an evenly distributed precipitation above the normal, and other favorable conditions are present for the rapid development of urediosporic generations. Low temperatures appear to be the major limiting factor in the development of primary infection and subsequent development of uredia, whereas lack of an even distribution of sufficient precipitation is the major inhibiting factor in the development of subsequent urediosporic generations during most years. The sequence of factors necessary for stem rust epidemics is fulfilled only in occasional years in the winter wheat areas of Nebraska.

Some new or unusual disease developments on wheat in Kansas, C. O. JOHNSTON (*Kans. Acad. Sci. Trans.*, 33 (1930), pp. 31-40).—As a result of rank growth in wheat in 1929 owing to abnormal weather conditions described, scab (*Gibberella saubinetii*), leaf blotch (*Septoria tritici*), and black chaff (*Bacterium translucens undulosum*), hitherto regarded as minor diseases of wheat, and crinkle joint (cause unknown, relatively new in Kansas) figured prominently, causing considerable losses. The reactions of various wheats to leaf blotch are tabulated.

Penetration of *Fusarium vasinfectum aegyptiacum* into roots of cotton [trans. title], T. FAHMY (*Bul. Soc. Bot. Genève*, 2. ser., 22 (1930), pp. 62-125, pls. 3, figs. 25).—This paper gives a condensed history of the development of cotton culture in Egypt, and a brief account of work done on wilt (*F. vasinfectum aegyptiacum*) during the period from 1882 to 1926. The disease is compared with sore shin, dealt with by Briton-Jones in 1922 (*E.S.R.*, 55, p. 345), and the growth of the wilt fungus in media containing nitrogen in the form of calcium nitrate is compared with that in media containing ammonium chloride in the presence of different carbohydrates.

Ascochyta disease of flax [trans. title], H. DIDDENS (*Tijdschr. Plantenziekten*, 35 (1929), No. 9, pp. 251-253).—Late in May 1928 yellow, stunted flax plants were found mingled with sound and vigorously growing young plants. The trouble was determined as a foot and bast rot associated with *A. linicola*.

Cardinal temperatures of pea-wilt fusaria in culture, K. TOGASHI (*Japan. Jour. Bot.*, 5 (1931), No. 4, pp. 385-400, fig. 1).—Following up the accounts previously noted (*E.S.R.*, 67, p. 269), the author now describes in summary detail the temperature relations of the *Fusariums* in cultures, estimating the cardinal points for optima of mycelial growth and sporulation.

"As seen in most fungi the temperature limits for the sporulation of the fusaria studied were narrower than those for the mycelial growth."

Diseases of peas in Arizona, J. G. BROWN and M. M. EVANS (*Arizona Sta. Bul.* 142 (1933), pp. 41-78, figs. 16).—This is a presentation of general information on the symptoms, causes, and control of various parasitic diseases, including powdery mildew, downy mildew, *Fusarium* foot rot, *Rhizoctonia* root rot, Texas root rot, bacterial blight, and nematodes and certain physiological troubles resulting from drought, alkali, and hail.

Investigations concerning the plant and tuber rot of potato and its control [trans. title], R. SCHANDER and G. STAAR (*Arb. Kartoffelbaugesell.*, No. 33 (1930), pp. 138, pls. 2, figs. 14).—This account deals in systematic detail with potato blight (*Phytophthora infestans*), as regards the plant, the disease, and the remedial measures including the methods of their application.

The blue discoloration of potatoes [trans. title], H. L. G. DE BRUYN (*Tijdschr. Plantenziekten*, 35 (1929), No. 7, pp. 185-222, pls. 2; *Eng. abs.*, pp. 216-220).—The blue discoloration of potato tubers which causes in some years considerable damage, presumably the same phenomenon as that described under the name bruise by Horne (*E.S.R.*, 28, p. 648), is here described in detail, with reference to later views regarding the nature of the trouble.

One cause frequently met with is mechanical injury. A causal or conditioning relation was supposedly established between the specific gravity of the tuber and this change or susceptibility thereto. The stem end of the tuber, which is the more susceptible area to bruise, has also the highest specific gravity. In case of Roode Star, the lowest specific gravity was attained when low or lacking in nitrogen but with potassium present; only the tubers having the highest specific gravity were susceptible, but the general influence of manuring is not quite clear. On certain soils dark spots were observable externally in many tubers, particularly those especially liable to strong blue discoloration. These spots were mostly at the stem end, sometimes as far as halfway down the tuber but never at the distal end. These spots increase in size and number for some months after digging. Internally they appear to be necrotic regions situated ± 1 mm from the skin and parallel thereto. References are given to this condition as noted by other authors.

The number of the spots is augmented by nitrogen and lessened by potash manuring. Diseased tubers if carefully handled appear normal. The gradual

increase in the size and number of the spots suggests an organism as the cause, but no proof of this is yet evident. Tuber-grafting tests for virus proved negative.

Experimental studies on the possibility of primary infection of *Piricularia oryzae* and *Ophiobolus miyabeanus* internal of rice seeds [trans. title], H. SUZUKI (*Ann. Phytopath. Soc. Japan*, 2 (1930), No. 3, pp. 245-275, pl. 1, fig. 1; *Eng. abs.*, pp. 274, 275).—Rice seeds infected by *P. oryzae* or *O. miyabeanus* (*Helminthosporium oryzae*) show usually a small or large discoloration, sometimes only a shriveling effect. Absence of external symptoms does not insure soundness, as internal parasites in healthy-looking plants have been demonstrated by microscopy as well as by isolation experiments.

The method of selection for healthy rice seeds by the use of a salt water solution (sp. gr. 1.1) seems to be inapplicable.

P. oryzae and *O. miyabeanus* appear able to infect rice (so as to show in the seeds) at any period before or after blooming. These fungi appear able to infect the young seedlings soon after germination in the spring.

Rice seeds may harbor these fungi in a viable state, *P. oryzae* for at least two years and *O. miyabeanus* for four years, under certain indicated conditions. Viability is destroyed after five minutes in *P. oryzae* kept in water at 50° C., in *O. miyabeanus* at 55°.

On the influence of copper sulfate to the growth of *Piricularia oryzae*, with special reference to the temperature as an environmental factor [trans. title], T. ABE (*Ann. Phytopath. Soc. Japan*, 2 (1930), No. 3, pp. 171-196, figs. 11; *Eng. abs.*, pp. 195, 196).—Testing first the relation of temperature to the growth of the strain of *P. oryzae* to be used, the author found that on potato decoction agar containing 1 percent of sucrose the most vigorous mycelial growth occurred at a temperature near 28° C., this vigor lessening gradually for temperatures about 24°, 20°, 11°, and 36°.

At about 28°, the most favorable temperature, mycelial growth was stimulated by adding copper sulfate in concentrations between $\frac{1}{6000}$ and $\frac{1}{400}$ M, the maximum stimulation occurring around $\frac{1}{1000}$ M. In liquid medium also a stimulating action of copper sulfate was noticeable, but this was not so great as in the case of the agar medium.

At 20°, 24°, and 32° no stimulating action of the copper sulfate was noticeable. At about 36° no conclusive results were obtained either in the liquid or on the agar. At any temperatures employed, conidia formed in inverse proportion to the copper sulfate present, when this was above $\frac{1}{6000}$ M, the formation becoming almost nil when $\frac{1}{400}$ M was reached.

On the culture media having copper sulfate in concentrations higher than $\frac{1}{600}$ M, chlamydospores formed at all the temperatures tested. In contrast to the tendency observed in conidial formation, the limitation of chlamydospore formation in relation to copper sulfate concentration lowered in proportion to the temperature departure from the optimum for mycelial growth.

The development of the aerial mycelium decreased with the concentration of copper sulfate, being absent at $\frac{1}{200}$ M for all temperatures.

Coloration and attenuation changes are detailed for certain concentration ranges.

Comparative studies of *Bacterium sesami* with *B. solanacearum* and *B. sesamicola* [trans. title], K. NAKATA (*Ann. Phytopath. Soc. Japan*, 2 (1930), No. 3, pp. 229-243, pl. 1; *Eng. abs.*, pp. 242, 243).—A comparative study was made of the morphology, cultural characters, and physiology of these three forms, recorded as causing sesame diseases.

The author inclines to consider *B. sesami* as identical with *B. sesamicola* (synonymous with *Pseudomonas sesami*) and as distinguished from *B. solanacearum*. A description is recorded.

The physiology and variations of *Cercospora beticola* in pure culture, G. H. COONS and F. G. LARMER (*Mich. Acad. Sci., Arts, and Letters, Papers, 11* (1929), pp. 75-104, pls. 3).—Sugar beet leaf spot is caused by *C. beticola*. This organism grows well on most of the standard culture media. Though light supposedly affects its development but little, temperature materially affects the vegetative growth. Conidial production in artificial cultures has been found to be a response to a nutrient stimulus, light and temperature influences being flexible.

Zonation in cultures is due to the differential growth of mycelium and not to conidial production. It can be induced by alternating conditions of light and temperature, other factors influencing but not initiating zonation.

Variant forms appearing as wedge-shaped sectors isolated from single-spore cultures of *C. beticola* have proved constant on artificial media. Though passage of the aberrant forms through sugar beets has measurably restored the normal color, this has only partially changed some morphological characters.

Attempts to produce variations by wounding, exposure to gas, low temperatures, or chemicals have failed. Mixing a normal mycelium with a variant culture gave a sectoring pattern resembling the normally occurring type and indicating the mechanics of sector formation.

The behavior of these variant forms indicates that they should be regarded as modified forms having their development determined partly by nutritional disturbances.

Relative resistance to mosaic of native and imported sugarcane varieties [trans. title], P. R. KUNTZ (*Puerto Rico Dept. Agr. and Com. Sta. Circ. 101* (1932), *Spanish ed.*, pp. 23, figs. 6).—Comparative studies of 26 popular varieties and new canes, made in cooperation with a central at Manati, showed the percentages of infection with mosaic to range from 0 in P.R. 803, P.R. 807, M. 7, and M. 42 to 19 in B.H. 10 (12). P.O.J. 2727 had 1 percent; Co. 281, 1.3; F.C. 998, 2; P.O.J. 2725, 2.3; F.C. 916, 2.5; P.O.J. 2714 and P.O.J. 2878, 3; Badilla, 7; Caledonia Amarilla, 11.7; P.R. 826, 12.3; S.C. 12 (4), 14; D. 433, 16; and F.C. 966, 18.7 percent. The new and the more popular canes are grouped according to their relative susceptibility. The zones of infection in 1931 and 1932 are shown on outline maps, and the areas of important varieties are indicated for the 1927-28 and the 1931-32 crops.

Downy mildew of tobacco, E. E. CLAYTON and J. G. GAINES (*U.S. Dept. Agr. Circ. 263* (1933), pp. 8, figs. 3).—Downy mildew or blue mold of tobacco is described, and the life history of the causative organism (*Peronospora hyoscyami*) is traced. This is primarily a seed bed disease, although it occasionally attacks plants in the field. Control methods include the sowing of an increased number of plant beds by growers so that some at least escape severe damage or entirely, and transplanting as rapidly as plants become large enough in mildew-free beds, or in infected beds delaying transplanting until the attack subsides and plants recover.

A program is suggested for those who desire to try spraying. Bordeaux mixture appears to be about as effective as any other spray or dust, and either a 3-4.5-50 or a 4-6-50 formula may be used. Applying the spray regularly every seven days and starting as soon as the plants are 0.25 in. across are suggested. These treatments may also assist in the control of certain other leaf spot and plant bed troubles. Spraying should be stopped a week before

transplanting, however, as there is evidence that plants heavily sprayed just before they are set out may not live as well as those not sprayed.

Comparative serological and pathological investigations of the fire-blight organism and a pathogenic fluorescent group of bacteria, H. R. ROSEN and W. L. BLEECKER (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 2, pp. 95–119, pl. 1, figs. 5).—This paper is devoted largely to the details and results of serological studies at the Arkansas Experiment Station of a fluorescent bacterial pathogen found in isolations from blighted unopened pear and apple blossoms and here designated as pear and apple blast. On the one hand the pathogen showed numerous cultural and physiological reactions identical with those of the fire blight organism (*Erwinia amylovora*) and on the other presented characteristics which have been attributed to various fluorescent plant pathogens. Comparisons were made with isolates of *E. amylovora* and *Phytomonas syringae*, *P. citriputeale*, and *P. prunicola* with respect to physiology, cultural characteristics, morphology pathogenicity, and serology.

The lilac blight organism (*P. syringae*), the English plum wilt pathogen (*P. prunicola*), and the newly identified pear blast isolates produced indistinguishable symptoms on pear twigs and leaves, the symptoms being obtainable with or without wounds. The pear blast isolates *P. syringae* and *P. prunicola* produced symptoms on oranges and lemons that were indistinguishable from those produced by the citrus blast pathogen *P. citriputeale*. *E. amylovora* isolates, on the other hand, produced no infections on orange and lemon.

The results of the serological tests were in full agreement with those of the pathogenicity studies. *P. syringae*, *P. citriputeale*, and *P. prunicola* and pear blast isolates were so closely related, as shown in cross agglutination tests, as to be indistinguishable. The close correlation shown between pathogenicity and serological reactions is believed indicative of the value of the latter in determining relationships of bacterial plant pathogens.

Studies on a new canker disease of Japanese pear trees caused by *Phomopsis fukushii* n. sp., S. TANAKA and S. ENDO (*Tottori Nōgaku-Kwaihō (Trans. Tottori Soc. Agr. Sci.)*, 2 (1930), No. 1, pp. 123–134, pls. 2).—An account is given of studies on a new canker of Japanese pear trees (*Pyrus serotina*), said to have been first noticed by T. Fukushi in 1924 and studied after 1925 by the present authors. The disease is known to be prevalent in Tottori, Kanagawa, and Saitama Prefectures. The causal fungus (*P. fukushii*) invades cut ends of branches and wounds on trunks and limbs, causing dark brown cankers. The pear varieties Okusankichi, Nijisseiki, and Taihei are more or less resistant, while Imamura-aki, Imamura-natsu, Chōjūrō, and Meigetsu are susceptible.

On artificial inoculation, the fungus attacks not only the Japanese pear trees but also European pear trees (*P. communis*). Apple trees are immune. The temperature range for the mycelial growth of the fungus is about 8° to 33° C.

Comparisons of new and old materials for scab control, W. C. DUTTON (*Michigan Sta. Quart. Bul.*, 15 (1933), No. 3, pp. 178–181, fig. 1).—Severe scab conditions in 1932 permitted a thorough test of 17 different protective materials. No material gave complete control, but certain kinds, including lime-sulfur (2.5–100), gave satisfactory results, even on the highly susceptible McIntosh variety. With Jonathan all materials gave fair or better results, ranging from 30.6 to 95.7 percent of scab-free fruits, with the control 100 percent scabby. The need of thorough and timely treatment is stressed.

Spoilage of stone fruits on the market, C. BROOKS (*U.S. Dept. Agr. Circ.* 253 (1933), pp. 12, figs. 6).—Citing data procured by the Bureau of Agricul-

tural Economics on decay losses in peaches in transit, the author points out the correlation between shipping losses in Georgia peaches traceable to brown rot and the rainfall occurring during the growing period. On the other hand the occurrence of *Rhizopus* rot during transit was determined almost entirely by picking, packing, and shipping conditions and not by rainfall. With cherries, peaches, and plums, sound fruit from unsprayed trees developed approximately four times as much brown rot in transit as did sound fruit from sprayed or dusted trees. The development of brown rot was greatly stimulated by injuries such as those caused in careless handling.

Observing a much higher percentage of both brown rot and *Rhizopus* in the upper crates within a car, temperature studies were conducted within experimental cars which showed that in a trip lasting from 3.5 to 4.5 days the temperature in the top of the load averaged about 12.5° F. higher than at the bottom. The period required for the top fruit to lower to 50° was approximately five times that of the lower fruits. Four methods of reducing spoilage, namely, precooling, use of car blowers, addition of salt to ice, and addition of dry ice to the ice, are discussed.

A test with potassium sulfate against leaf marginal disease of red currant [trans. title], T. A. C. SCHOEVERS (*Tijdschr. Plantenziekten*, 35 (1929), No. 8, pp. 231-233, pls. 2).—In recent years a leaf margin disease has been coming increasingly into notice, particularly in case of currant and apple. The phenomenon appears to depend rather upon conditions within the plant than upon those in the leaf areas affected. It becomes noticeable in mid-summer (July), and later it becomes very striking, as the leaves show check in growth, deepening marginal discoloration, curling, and eventual dryness. The trouble is contrasted with the so-called die-back attributed to the presence of a *Botrytis*. A soil relation is thought to be causal in the present case, and the increased use of potassium sulfate is regarded with favor.

A new species of *Urocystis* on *Convallaria majalis* L., K. TOGASHI and F. ONUMA (*Japan. Jour. Bot.*, 5 (1930), No. 1, pp. 21-26, fig. 1).—A disease (supposedly new) of *C. majalis*, noted halfway up Mount Himekami in the Province of Rikuchu, yellowing and stunting the plants, was associated with a fungus supposed to be a new member of *Urocystis*. A technical description has been furnished to accompany the name applied to the fungus, *U. miyabeana*.

A serious case of dwarfing and malformation of narcissus (Soleil d'Or), D. H. JONES (*Sci. Agr.*, 10 (1930), No. 11, pp. 750-753, figs. 3).—In case of a planting of 140,000 Soleil d'Or narcissus bulbs (1929-30), about 50 percent of the flowers produced were unfit for sale on account of dwarfing, malformation, and brown spot discoloration of the stems and foliage. No fungus or bacteria could be found, and the disease was not noticeably progressive, but the lesions appeared characteristic of those caused by *Tylenchus dipsaci*. None of the nematodes were present, but it is thought probable that the bulbs producing the diseased plants had been infested with *T. dipsaci* while growing in the field and that after being harvested the bulbs had been treated to destroy the nematodes. The injury done to the bulbs by the nematodes previous to their destruction is deemed responsible for the abnormal appearance of the flower stalks and leaves and for the brown markings and decayed areas inside the bulbs.

The bulb- or stem-nematode (*Tylenchus dipsaci* Kühn) as a pest of phlox, G. STEINER and B. O. DODGE (*Jour. N.Y. Bot. Gard.*, 30 (1929), No. 356, pp. 177-184, figs. 4).—Phlox disease due to *T. dipsaci* is said to have been observed in the United States as early as 1923. A description of the diseased plants is given, with accounts of observations on areas affected by the nematode.

Recommendation as to control emphasizes complete removal and burning of diseased plants and infested soil.

Angular leaf spot of *Zinnia elegans* Jacq. caused by eelworms (preliminary report), T. FUKUSHI and H. SAITO (*Tottori Nōgaku-Kwaihō (Trans. Tottori Soc. Agr. Sci.)*, 2 (1930), No. 1, pp. 45-56, pl. 1).—In this preliminary report a new angular leaf spot disease of *Z. elegans* is described as noted at Nagi-Mura in 1928. It is said to be of abundant occurrence locally in the province of Inaba, Japan. It is due to attack by a nematode, *Aphelenchus ritzema-bosii*, which it is stated also readily attacks *Phlox drummondii* and *Dahlia variabilis* in foreign countries. When artificially inoculated, it attacks healthy leaves of zinnia and dahlia and multiplies in the diseased tissues. The results of inoculation experiments on chrysanthemum leaves were inconclusive, though a few naturally infested chrysanthemums were found growing near the affected zinnia plants.

The elm disease and the elm bark beetle [trans. title], J. G. BETREM (*Tijdschr. Plantenziekten*, 35 (1929), No. 11, pp. 273-288, pls. 3; *Ger. abs.*, pp. 284, 285).—It is shown in this account of experimentation that *Scolytus scolytus* can transmit *Graphium ulmi*, thus infecting the wounds which it has made with the Dutch elm disease.

On the life history of *Uredinopsis pteridis*, with a special bearing on its peridermal stage [trans. title], S. KAMEI (*Ann. Phytopath. Soc. Japan*, 2 (1930), No. 3, pp. 207-228, pl. 1; *Eng. abs.*, pp. 226-228).—In contrast to the views resulting from the findings of Weir and Hubert (*E.S.R.*, 38, p. 553). to the effect that the teliospores of *U. pteridis* seem to have the power of germinating as soon as they are ripe (without hibernation) and that the needles of *Abies* become infected in the late summer or fall, the aecia appearing early the next spring, the present author states that the teliospores of *U. pteridis* on *Pteridium aquilinum japonicum* collected near Sapporo were proved to germinate in the spring after having overwintered and to infect *A. mayriana* when the needles were still young, the peridermal stage germinating about a month after the inoculation. The author questions, for reasons detailed, the finality of the claims above referred to.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The musk rat in Germany (*Jour. Min. Agr. [Gt. Brit.]*, 39 (1932), No. 8, pp. 719-724).—This is an account of the North American muskrat, a few pairs of which were released in central Europe in 1905. It has multiplied so rapidly and done such extensive damage that the German Government has had to take active steps to keep it in check. It infests streams, canals, ponds, and ditches, and does great damage by burrowing in the banks and by building obstructions in the beds of streams. It also causes damage to agricultural crops, freshwater fish, and mollusks, and may attack small livestock.

Notes on the giant toad, *Bufo marinus* (L.), in Puerto Rico, M. D. LEONARD (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 67-72).—This contribution from the Puerto Rico Insular Experiment Station reports upon the distribution, life history, and habits, so far as known, of the giant toad (*B. marinus*), together with a summary of a study of its food habits which indicates that it consumes large quantities of injurious insects. It is pointed out that live toads have been shipped to Hawaii and become established.

Justifying expenditures for entomological research, J. J. DAVIS (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 72-79).—In this contribution from the Indiana Experiment Station information is presented which shows large returns to

have resulted from the expenditure of Federal and State funds for entomological research.

A method of determining losses to forests caused by defoliation, J. N. SUMMERS and A. F. BURGESS (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 51-54).—A brief discussion of the problem is presented in connection with formulas that have been developed, based upon June and July defoliation in New England.

Some examples of varietal resistance of plants to insect attacks, G. F. MACLEOD (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 62-67, figs. 3).—The author has found sweet Spanish varieties of onions to be resistant to the onion thrips and green celery varieties resistant to injury by the tarnished plant bug.

Shipping adult insect parasites in refrigerated containers, J. K. HOLLOWAY (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 280-282, pl. 1).—The author reports that "a refrigerated container devised to decrease the mortality in shipments of parasites has been used successfully in transporting frail adult stages of several species of parasites of the oriental fruit moth (*Grapholitha molesta* Busck) to practically all of the peach-growing centers in the eastern part of the United States. The shipments were made throughout the entire summer of 1931. The average consignment was in transit 50 hours, and the average mortality of *M[acrocentrus] ancylivorus* Roh. shipped under such conditions was only 1.4 percent."

[Work with economic insects, etc., in California] (*California Sta. Rpt. 1932*, pp. 30, 58-65).—Reference is made to the progress of (E.S.R., 67, p. 559) beekeeping investigations, including studies of low diastase content of honeys caused by low pollen content and of losses of bees from buckeye poisoning; work with insect parasites and predators of the peach twig moth and other pests; use of insecticides for control of red scale, latania scale, and walnut husk fly; oil sprays and tank mixture methods (E.S.R., 67, p. 563); miscellaneous chemical sprays, including sodium nitrate for mealy plum aphid; dusts; soil fumigants; irrigation and flooding in the control of pear thrips; control of the vegetable weevil; and nematodes, slugs, and snails.

[Report of work in entomology in Delaware] (*Delaware Sta. Bul. 179* (1932), pp. 29-37).—In this report (E.S.R., 66, p. 550) the important insects of the year are dealt with by L. A. Stearns; the mosquito survey and bionomics and control of the codling moth and the oriental fruit moth by Stearns and D. McCreary; and bionomics and control of the grape leafhopper, the plum curculio, and the grape berry moth by Stearns, L. L. Williams, and McCreary.

[Report of work in entomology in Indiana] (*Indiana Sta. Rpt. 1932*, pp. 34-38, figs. 3).—Brief reference is made to the work of the year with insects (E.S.R., 67, p. 560), including the onion maggot, cucumber beetles, cabbage worm, potato leafhopper, the mint flea beetle, European corn borer, codling moth, and oriental fruit moth.

[Report of work in entomology in Iowa] (*Iowa Sta. Rut. 1932*, pp. 54-60, figs. 2).—Progress during the year in entomology (E.S.R., 67, p. 424) is briefly noted under the headings of white grub investigation, by C. J. Drake and E. V. Collins; time and labor factors involved in gathering, ripening, and storing of honey by honeybees, by O. W. Park; bionomics and control of the apple maggot (*Rhagoletis pomonella* Walsh), by C. H. Richardson; Hessian fly survey, cornstalk borers (*Papaipema nebris* Guen., *Luperina stipata* Morr., etc.), and biology and control of onion insects, particularly as vectors in the yellow dwarf disease, all by Drake; quantity of bait eaten by grasshoppers and effect of carbohydrates on longevity of the apple maggot fly, both by Richardson; stock replacement in honeybees and studies on the races of bees, both by

Park; survey of potato insects, by Drake; and a study of egg deposition, poisons, attractants, and parasites of injurious grasshoppers in Iowa (differential, two-striped, and red-legged grasshoppers and *Melanoplus mexicanus* Sauss.), by Drake and Richardson.

[Report of work in entomology and limnology by the New York Cornell Station] (*New York Cornell Sta. Rpt. 1932, pp. 116-126*).—The work of the year (E.S.R., 66, p. 647) is briefly reported upon as to insecticides for control of the striped and spotted cucumber beetles and of insects attacking potatoes on Long Island; wireworms and their relation to pitting of potatoes; onion maggot control; tests of naphthalene in the prevention of injury to carrots and celery from the carrot rust fly; control of the tarnished plant bug; potato spraying experiments on muck lands; millipedes and scab gnats in their relation to potato tuber defects; effects of radiant energy on insects; utilization of carbohydrates and proteins by the onion thrips; honey color; wild insects in apple orchards; the flight of honeybees from different kinds of colonies; weevil fumigation with ethylene oxide; biology and control of the webbing clothes moth; control of dermestid larvae injurious in dwelling houses; the columbine borer and gladiolus thrips; transmission of the abortion organism, *Brucella abortus*, by fecal feeding flies; relation of water temperature to food consumption in trout; the relation of weight to length in various races of trout reared on nature; and on artificial foods; base bass cultural investigations; and cause of curdled milt in rainbow trout.

[Report of work in entomology in Ohio] (*Ohio Sta. Bul. 516 (1933), pp. 46-54, fig. 1*).—The work of the year (E.S.R., 67, p. 50) is referred to under the headings of codling moth, including its biology and use of treated bands as a supplementary codling moth control by C. R. Cutright; wireworms, by H. L. Gui; the onion maggot, by J. P. Slesman; the European corn borer, by L. L. Huber, J. B. Polivka, E. G. Kelsheimer, and J. R. Savage; the gladiolus thrips (*Taeniothrips gladioli* M. & S.), by E. A. Herr; the oriental fruit moth, by R. B. Neiswander and M. A. Vogel; and control of the small brown ant in golf greens, *Lasius niger neoniger* Emery, by C. R. Neiswander.

[Contributions on economic entomology] (*Jour. Dept. Agr. Puerto Rico, 16 (1932), No. 2, pp. 81-144, pls. 3, figs. 9*).—The contributions presented include the following: Descriptions of New Mymarid Egg Parasites from Haiti and Puerto Rico (pp. 81-91), Notes on the Genus *Aneristus* Howard, with Descriptions of New Species [*A. mangiferae*, *A. hispaniolae*, and *A. asterole canii*] (Hymenoptera: Chalcidoidea) (pp. 93-102), and Two Important West Indian Seed Infesting Chalcid Wasps [*Tanaostigma haematoxyli* n.sp. and *Bephrata cubensis* Ashm.] (pp. 103-112), all by H. L. Dozier; Three Species of *Empoasca* Leafhoppers Known to Affect Economic Plants in Haiti, Including the Description of Two New Species (*E. fabalis* DeL., *E. gossypii* n.sp., and *E. canavalia* n.sp.), by D. M. DeLong (pp. 113-116); A New Citrus Cambium Miner (*Asynapta citrinae* n.sp.) from Puerto Rico, by E. P. Felt (pp. 117, 118); A New Neotropical Genus of Eupteryginae (Homoptera) from Puerto Rico [*Hybla maculata* n.sp.], by W. L. McAtee (pp. 119, 120); and Insect Conditions in Puerto Rico during the Fiscal Year, July 1, 1930, through June 30, 1931, by M. D. Leonard (pp. 121-144).

[Contributions on economic insects] (*Jour. Southeast. Agr. Col., Wye, Kent, No. 28 (1931), pp. 137-187, figs. 18; 211-215*).—The contributions presented include the following: Some Observations on Winter Moth Caterpillar [*Cheimatobia brumata*] Attack on Fruit Trees in 1929-30 (pp. 137-146) and A Note on the Strawberry and Raspberry Bud Weevil, *Anthonomus rubi* (Herbst) (pp. 147-152), both by S. G. Jary; A Contribution to the Biology

of the Apple Capsid (*Plesiocoris rugicollis* Fall.) and the Common Green Capsid (*Lygus pabulinus* Linn.), by M. D. Austin (pp. 153-169); Observations on Gall Midges Affecting Fruit Trees (pp. 170-177) and Notes on the Outbreak of the Cabbage Aphid (*Brevicoryne brassicae* Linn.) in 1929 (pp. 178-180), both by F. H. Barnes; The Preparation of Oil Sprays—I, The Use of Oleic Acid as Emulsifier, by H. Martin (pp. 181-187); and Insect Visitors to Fruit Blossoms by C. H. Hooper (pp. 211-215).

[Notes on economic insects and insecticides] (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 291-304, fig. 1).—The contributions presented (E.S.R., 68, p. 636) include the following: Propylene Dichloride as a Fumigating Material, by R. Hutson (p. 291); The Gladiolus Thrips, *Taeniothrips gladioli* M. and S., in California, by S. F. Bailey (pp. 291, 292); Arsenic in Bait-Poisoned Grasshoppers, by T. H. Hopper (p. 292); Parasites from a Bird's Nest, by W. E. Whitehead (pp. 292, 293); *Abia americana* (Cresson) on *Lonicera*, by H. H. Keifer (p. 293); *Rhizopertha dominica* as a Library Pest, by W. A. Hoffman (pp. 293, 294); A Braconid Parasite [*Homotylus terminalis*] of a Coccinellid [*Cycloneda sanguinea* L.] New to Puerto Rico, by M. D. Leonard (p. 294); Control of an Infestation of the Cigarette Beetle in a Library by the Use of Heat, by A. W. Cressman (pp. 294, 295); The Flannel Moth [Megalopygidae] in Arizona, by W. W. Jones (pp. 295, 296); Coleoptera Captured in Japanese Beetle Traps, by F. W. Metzger and R. J. Sim (pp. 296, 297); A Note on the Hibernation Habits of Some Engraver Beetles of the Genus *Ips*, by F. P. Keen (pp. 297, 298); Notes on a Coccinellid (*Hyperaspis 8-notata* Casey) Predacious on Citricola Scale (*Coccus pseudomagnoliarum* Kuwana) in Tulare County, California, by F. T. Scott (pp. 298, 299); The Toxicity of the Common Castor-Bean Plant in Respect to the Japanese Beetle, by F. W. Metzger (pp. 299, 300); Outbreak of Grasshoppers [the American Grasshopper, Red-Legged Grasshopper, et al.] in Tennessee during 1932, by W. W. Stanley (pp. 300, 301); Why Not Bourgault's Trap for Horse-Flies? by B. Segal (pp. 301, 302); and Comparative Toxicities, with Special Reference to Arsenical and Fluorine-Containing Insecticides, by F. DeEds (pp. 302-304).

Review of United States patents relating to pest control, [January-March 1932], R. C. ROARK (*U.S. Dept. Agr., Bur. Chem. and Soils, Rev. U.S. Pat. Relat. Pest Control*, 5 (1932), Nos. 1, pp. 11; 2, pp. 12; 3, pp. 12).—This volume, complete in three numbers, is in continuation of those previously noted (E.S.R., 67, p. 150).

Oil spray recommendations, R. H. ROBINSON and L. CHILDS (*Oregon Sta. Circ.* 107 (1933), pp. 8).—Methods for the preparation of home-made emulsions and the tank-mix oil spray are outlined by the authors.

Winter spraying of orchards, with particular reference to the control of red mite and apple capsid bug, J. CARROLL and E. MCMAHON ([*Irish Free State*] *Dept. Agr. Jour.*, 31 (1932), No. 2, pp. 190-198).—In continuation of earlier work (E.S.R., 65, p. 757), Sunoco and Winter Volck, both used alone and in combination with a tar distillate (Carbokrimp) and in making two proprietary combination oil and tar-distillate sprays, gave very good control of the red mite (*Oligonychus ulmi*), aphid, and apple sucker (*Plesiocoris rugicollis*).

Effect of lead arsenate insecticides on orange trees in Florida, R. L. MILLER, I. P. BASSETT, and W. W. YOTHERS (*U.S. Dept. Agr. Tech. Bul.* 350 (1933), pp. 20, figs. 8).—This is a report of work conducted with a view to determining the effect of arsenical bait sprays such as are used for eradication of the Mediterranean fruit fly on citrus trees and fruit.

"No noticeable effect on the fruit, tree, or undergrowth of a grapefruit tree was produced by 60 spray applications of 0.5 lb. each of lead arsenate in 7.5 gal. of water to the soil under the tree. The applications were made over a period of 1½ years, and at the end of that time there were 2,000 parts of arsenic trioxide per million in the first 2 in. of soil, while only a trace was present in the leaves. Likewise, there was no effect on the fruit, tree, or undergrowth of an orange tree after 14 applications of 0.5 lb. of lead arsenate each in 7.5 gal. of water, even though there were 700 parts of arsenic trioxide per million in the first 2 in. of soil. One year after the last application an analysis of the soil under the grapefruit tree was again made and 1,800 p.p.m. was found in the first 2 in. of soil, and even at that time the tree, fruit, and undergrowth were normal. . . .

"The solids of fruit juice were somewhat increased when as little as 0.008 mg of arsenic trioxide was present, but when more than this quantity was present the solids were decreased. In this case also, approximately the same quantity of arsenic that stimulated the catalase activity caused the solids in the juice to be increased. . . . When the trees were sprayed 17 times with 5 gal. per application a maximum of 0.16 mg of arsenic trioxide per liter of juice was found.

"Experiments made by the writers have demonstrated that the effect of arsenic is not systemic, only the sprayed part of a tree being affected. The effect of spraying with arsenicals is shown almost immediately and persists to a slight degree for about 18 months. After 2½ years, however, it has entirely disappeared."

The effect of different soaps on lead arsenate in spray mixtures, J. M. GINSBURG (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 2, pp. 179-182).—In work at the New Jersey Experiment Stations "apple trees were sprayed three times at 2-week intervals with mixtures consisting of lead arsenate, hydrated ferric oxide, and each of the following soaps: Commercial potash fish-oil soap, potassium oleate, and triethanolamine oleate. The spray containing fish-oil soap produced severe injury and caused about 30 percent leaf drop. The injury from the potassium oleate spray was limited to spots on the leaves and browning of the leaf edges. The injury from the triethanolamine oleate spray was very slight and did not appear until after the third application.

"Simultaneously with the field tests the action of the following soaps on lead arsenate was tested in the laboratory: Potash fish-oil soap, sodium oleate, potassium oleate, ammonium oleate, and triethanolamine oleate. The results indicate that soaps of strong bases form more soluble arsenic than soaps of weak bases. Of all the soaps tested, potash fish-oil soap produced the greatest quantity of soluble arsenic and triethanolamine oleate the least."

Extractive efficiency of kerosene on pyrethrum powders of varying fineness, H. H. RICHARDSON (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 252-259, fig. 1).—"The extractive efficiency of kerosene on pyrethrum powders of varying degrees of fineness was tested by comparing the insecticidal efficiency of such extracts with standard extracts of pyrethrum containing 50, 75, and 100 percent of the active constituents. House flies were used in the insecticidal tests, and the time, in seconds, until 50 percent of the flies were paralyzed was used as the main criterion for determining insecticidal power. Mortality data were taken, but, as reported in a previous paper [*E.S.R.*, 64, p. 854], the percentage kill was not a sufficiently sensitive index to indicate small differences in the pyrethrin content of kerosene extracts.

"The efficiency of extraction on 12 to 15, 20, 30, and 45 mesh pyrethrum powders was about the same in each case; it is estimated that 80 percent

extraction of the active constituents was obtained. Extraction of 200-mesh pyrethrum powder was more efficient, however, giving approximately 90 percent of the active constituents. Apparently the achenes, or seeds, which contain a very large percentage of the active constituents, are not thoroughly crushed in powders varying from 12 to 45 mesh, whereas with 200-mesh powder the achenes are entirely broken up. This difference might account for the observed differences in the extractive efficiency of kerosene on these various grades of powder."

The toxicity of certain plant extracts to goldfish, II, J. R. SPIES (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 285-288).—This second contribution (E.S.R., 67, p. 51) reports upon further determinations of the toxicity to goldfish of acetone extracts of certain reputedly poisonous plants. Preliminary determinations of the toxicity to insects of the most promising of these extracts have shown that a few of them may possess considerable insecticidal value.

The rotenone content of Malayan tuba root, C. D. V. GEORGI and G. L. TEIK (*Malayan Agr. Jour.*, 20 (1932), No. 10, pp. 498-507).—Analyses made of samples of tuba root drawn from commercial consignments have shown wide variations in the rotenone content. "As a result of the analyses of samples of roots from individual species, it appears that the variations are due to commercial consignments frequently consisting of roots from different species of *Derris* and also of varying age. As far as the results of analysis of individual species are concerned, the figures to date indicate that *D. elliptica*, tuba puteh, offers the best possibilities as a source of rotenone. The optimum conditions of cultivation and harvesting have yet to be determined. The roots of the other variety of *Derris* commonly occurring in Malaya, *D. malaccensis*, erect Sarawak, would appear to be lacking in rotenone."

A comparison of the effectiveness of sustained vacuum and dissipated vacuum in fumigation with hydrocyanic acid gas, S. E. CRUMB and F. S. CHAMBERLIN (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 259-262).—Experimental fumigation of cigars with hydrocyanic acid gas for the destruction of the cigarette beetle shows that under the conditions of the experiments fumigation with sustained vacuum was more effective than fumigation with dissipated vacuum.

A consideration of "interval shooting" as practiced in citrus fumigation, H. L. CUPPLES (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 262-269, figs. 6).—It has been found that, for the purpose of obtaining a maximum value of $\int C dt$ from a given quantity of fumigant, interval shooting apparently is less advantageous than the usual procedure of introducing the entire charge of fumigant at the beginning of the fumigation period.

Some methods used in testing cattle fly sprays, A. M. PEARSON, J. L. WILSON, and C. H. RICHARDSON (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 269-274, fig. 1).—Contributing from the Iowa Experiment Station, the authors report that a method which consists essentially of making close observations on sprayed cows of previously determined susceptibility to stable flies gave much better results than the present methods of testing cattle fly sprays for repellent efficiency.

"Thirty-five selected cows were used in determining the relative efficiency of six fly sprays. The cows were scrubbed with soap and water, then staked individually in a pasture, being removed only for watering and milking. The normal fly susceptibility of each cow was obtained from the average of two counts of the number of flies present, made hourly from 7 a.m. till 3 p.m. for a period of 3 days. The cows were then placed in 7 groups of 5 each, the maximum difference in the number of flies per cow per count between the groups

being about two. The six spray materials were then assigned by chance to each of 6 groups of 5 cows; the remaining group served as the control. Each cow was sprayed at 6 a.m. daily for 4 consecutive days with 2 fluid oz. of spray material applied with an electric sprayer. The fly susceptibility of the sprayed and control cows was determined as before. The results show that close individual observations of a relatively few cows of known fly susceptibility give more consistent and dependable results than less accurate observations on a large number of cows. The population of stable flies on unsprayed dairy cattle increases from 7 a.m. till about midday, after which it tends to become stationary."

A preliminary list of food-plants of some Malayan insects, N. C. E. MILLER (*Straits Settlements and Fed. Malay States Dept. Agr. Bul. 38, Sup. (1932), pp. 54*).—This is a supplement to Bulletin 38 previously noted (E.S.R., 56, p. 857).

The insect visitors of fruit blossoms, C. H. HOOPER (*Jour. Roy. Soc. Arts, 81 (1932), No. 4177, pp. 86–101, pls. 2*).—A brief account is given of the insect visitors of fruit blossoms, including the hive bee, bumblebees, other melliferous bees, wasps, ants, sawflies, flies, beetles, butterflies, and moths.

Reliability of differences between data obtained in cotton insect investigations, J. C. GAINES (*Jour. Econ. Ent., 26 (1933), No. 1, pp. 274–279*).—In this contribution from the Texas Experiment Station a statistical comparison is made of methods used in taking cotton insect infestations and in obtaining data on the growth of cotton plants in experimental plats.

Preliminary report regarding investigations on combating caterpillar pests in the oil palm cultivation, I. H. GONGGRIJP (*Commun. Gen. Expt. Sta. Alg. Ver. Rubberplanters Oostkust Sumatra, Gen. Ser. No. 48 (1931), pp. 31, pls. 5, figs. 3*).—The increasingly severe attacks upon oil palms by slug caterpillars (*Setora nitens* and *Orthocraspeda trima*), with the resulting defoliation of the leaves to the veins, over areas covering from 80 to 100 ha, led to the work reported and the finding of an effective method of control, the details of which are presented.

Observations on shade tree insects, E. P. FELT (*Jour. Econ. Ent., 26 (1933), No. 1, pp. 45–51*).—The occurrence of shade-tree insects in the Northeastern States in 1931 is reported upon.

How to combat certain pests of the household, S. MARCOVITCH (*Tennessee Sta. Bul. 147 (1933), pp. 19, figs. 13*).—A practical summary of information as to the control of insect and other pests of the household.

Naphthalene for the control of the onion thrips, F. B. MAUGHAN (*Jour. Econ. Ent., 26 (1933), No. 1, pp. 143–147, fig. 1*).—The use of crude naphthalene as a control measure for onion thrips on onions is said to have given excellent control. Significant reductions were obtained in the infestation and increases in yield of the treated plats over the untreated plats. The naphthalene was used at the rate of 300 lb. per acre in each application, the most effective control having been secured by applying the naphthalene directly on the row.

Gladiolus thrips, Taeniothrips gladioli, E. I. McDANIEL (*Michigan Sta. Quart. Bul., 15 (1933), No. 3, pp. 168–172, fig. 1*).—A practical account.

The 1932 grasshopper outbreak, J. R. PARKER (*Jour. Econ. Ent., 26 (1933), No. 1, pp. 102–108*).—The occurrence and importance of grasshoppers in 1932 is reviewed.

Hibernation in Orthoptera.—I, Physiological changes during hibernation in certain Orthoptera, J. H. BODINE (*Jour. Expt. Zool., 37 (1923), No. 5, pp. 457–476, figs. 7*).—This first contribution deals with the physiological changes during hibernation in certain grasshoppers.

Hibernation and diapause in certain Orthoptera.—II, III, J. H. BODINE (*Physiol. Zool.*, 5 (1932), No. 4, pp. 538-548, figs. 7; 549-554, figs. 4).—The second contribution deals with response to temperature during hibernation and diapause and the third contribution with diapause—a theory of its mechanism.

Observations on the Chinese mantid *Paratenodera sinensis* Saussure, S. W. BROMLEY (*Bul. Brooklyn Ent. Soc.*, 27 (1932), No. 4, pp. 196-201).—A brief account is given of the Chinese mantis, first established near Philadelphia, Pa., about 1896, and which now occurs in New York and New Jersey. Reference is also made to *Mantis religiosa* L., introduced from the Old World and now well established in New York about Rochester and Ithaca, where it was first reported in the summer of 1899. It has recently appeared on Long Island.

The economic status of the genus *Eurydema* with biological notes on *E. pulchrum* Westw. (Hemiptera, Pentatomidae), W. E. HOFFMANN (*Lingnan Sci. Jour.*, 11 (1932), No. 4, pp. 553-564, pl. 1).—Notes are presented on the food habits of species of *Eurydema*, particularly *E. pulchrum*, and on the life history of *E. dominulus* Scop., *E. oleraceum* L., and *E. ornatum* L. An account is given of the life history of *E. pulchrum*, together with a description of the several stages, natural and artificial control of *Eurydema* spp., *Eurydema* spp. as predators, a summary of plants attacked, and the economic status and control of *E. pulchrum* at Canton.

Report on the control of the Harlequin bug (*Murgantia histrionica* Hahn), with notes on the severity of an outbreak of this insect in 1932, H. G. WALKER and L. D. ANDERSON (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 129-135).—In this contribution from the Virginia Truck Experiment Station it is pointed out that the severe outbreak of the Harlequin bug during 1932 in the Norfolk truck crop area was due in part to the mild winter of 1931-32 and to the abundance of preferred host plants in abandoned fields and in seed kale fields.

“The best control of this pest was obtained with sprays in which rotenone was the active ingredient in combination with a 1 percent soap solution. In general, nicotine, pyrethrum, and oil emulsion sprays were not effective for use against this insect, except at very strong concentrations. Swallows were observed feeding on the adult insects. The egg parasite, *Ooencyrtus johnsoni* (How.), was found to parasitize from 35 to 55 percent of all the Harlequin bug eggs collected during August and September.”

Further studies of tarnished plant bug injury to celery, L. L. HILL (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 148-150).—In further studies (E.S.R., 67, p. 709) it was found that sulfur dust, 300 mesh or better, when used alone as a dust or when combined with hydrated lime either as a dust or as a spray, has been most effective in reducing tarnished plant bug injury in both early and late celery. An average of five applications was found necessary for control. The cost of material in every case is considered moderate.

***Draeculacephala mollipes* Say, a cicadellid pest of apples,** P. W. CLAASSEN (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 282-284, pl. 1).—An account is given of the injuries caused to the fruit and twigs of the apple by crescent-shaped oviposition punctures of the sharp-nosed leafhopper (*D. mollipes*). The females make a crescent-shaped cut, 3-4 mm long, through the skin of the apple or twigs and deposit from a few to more than 20 eggs within each egg puncture. As many as 125 egg punctures have been found on a single apple. The injury is largely restricted to the fruit and twigs on the lower portion of the tree.

Laurel-sumac as a source of red scale infestation, W. EBELING (*Calif. Citrogr.*, 18 (1932), No. 1, p. 4, figs. 2).—In this contribution from the Cali-

ifornia Citrus Experiment Station attention is called to the importance of destroying the laurel-sumac growing adjacent to citrus plantings, particularly if the shrub is known to be infested with red scale.

The codling moth and its control, L. HASEMAN (*Missouri Sta. Circ.* 169 (1933), pp. 4, figs. 2).—A practical account.

The oriental moth (*Cnidocampa flavescens* Walk.) in Massachusetts and the work of its newly introduced parasite, C. W. COLLINS (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 54-57).—The establishment and distribution of the oriental moth in Massachusetts is called to attention, and its favored food plants, seasonal history, and artificial control are noted. Especial attention is given to the introduction of a tachinid parasite (*Chaetexorista javanica* B. & B.) from Japan, its quick establishment, and the rather high degree of control effected within three and four years after the first introduction.

The European corn borer situation in the United States at the close of 1932, D. J. CAFFREY and L. H. WORTHLEY (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 85-102).—A review of the present distribution and importance of and control work with this pest in the United States.

Laboratory production of clusters of European corn borer eggs for use in hand infestation of corn, L. H. PATCH and L. L. PEIRCE (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 196-204, pls. 2).—The authors report upon a practical method of producing corn borer egg clusters in the laboratory for use in experimental infestation of corn.

Possibilities of combating wattle bag-worm with insecticidal dusts, L. B. RIPLEY and B. K. PETTY (*So. African Jour. Sci.*, 29 (1932), pp. 544-561, figs. 7).—In control work with *Acanthopsyche junodi* Heyl., data were obtained on the relative insecticidal efficacy and relative repellence of 12 different poisons at varying dosages.

Observations on cultural practices for the control of the potato tuber worm, *Phthorimaea operculella* Zell., G. S. LANGFORD (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 135-137).—A summary is given of experimental tests made on hilling or ridging potatoes for the control of the potato tuber worm. Ridged culture was found effective in reducing tuber injury if applied properly and timely.

The coffee clear wing hawk moth (*Cephonodes hylas* L.), G. H. CORBETT and M. Y. SHARIFF (*Malayan Agr. Jour.*, 20 (1932), No. 10, pp. 508-517, pl. 1).—A description is given, including the several stages and instars, of *C. hylas*, followed by a discussion of the economic importance, seasonal history and habits, life cycle, enemies, and means of control.

Tartar emetic as a poison for the tobacco hornworm moths.—A preliminary report, J. U. GILMORE and J. MILAM (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 227-233, fig. 1).—In tests made of 40 materials during several seasons in an effort to discover an efficient stomach poison for the tobacco hornworm moths (the tomato worm and the tobacco worm), it was found that a 5 per cent solution of tartar emetic is an effective and satisfactory poison when used in conjunction with isoamyl salicylate as an attractant. Large-scale field experiments have been conducted for three successive seasons with promising results.

The lesser peach borer (*Aegeria pictipes* G. & R.), M. A. VOGEL and R. B. NEISWANDER (*Ohio Sta. Bimo. Bul.*, 18 (1933), No. 2, pp. 51-54, figs. 2).—A brief practical account of this pest and means for its control. Paradichlorobenzene dissolved in crude cottonseed oil, at the rate of 1 lb. of the chemical to 2 qt. of the oil, has proved to be an efficient means of controlling the pest.

The sorghum worm in Missouri, L. HASEMAN (*Missouri Sta. Bul.* 320 (1933), pp. 8, figs. 6).—The sorghum webworm, a small woolly or spiny caterpillar known to science for many years, first appeared as a pest in Missouri in 1921, at which time it completely destroyed the sorghum grain crop over thousands of acres and greatly reduced the yields where it was less abundant. It reappeared in 1922 and 1923, doing considerable damage in restricted areas. From this time it continued to cause some injury, though more restricted in its distribution, until 1929 and 1930, when it was destructive in some parts of southeastern Missouri.

The webworm is most destructive to grain sorghums, kafir as a rule suffering most, although milo and feterita are also seriously attacked. In 1921 growers in 11 counties reported from 70 to 100 percent of their seed crop destroyed by the pest. The caterpillars of the early summer brood appeared in southeastern Missouri in 1922 in great numbers on ripening rye and on the heads of timothy, doing considerable damage in some rye fields. It was also found feeding on corn and on wild grasses, records showing it to be confined to plants of the grass family and to be most destructive on the unripe seed of the grain and sweet sorghums. The caterpillar feeds on the soft or maturing grain, hollowing the grain out so that practically nothing is left.

The sorghum webworm is multiple brooded (apparently three broods each year in Missouri), the heavy damage to the grain sorghums being caused by the larvae between the middle of August and the middle of October. It passes the winter in the almost full-grown larval stage, molts once in the spring, and feeds for a few days before pupating. At Perryville hibernating larvae in the upper part of broomcorn stalks taken in January 1924 remained in the larval stage until June 10, and one pupated without receiving food. In 1922 larvae were found on June 8 at Cape Girardeau feeding and damaging rye and timothy heads. In the laboratory they began to emerge as moths on June 14 and some emerged as late as July 3. Technical descriptions are given of the several stages.

The parasites reared include *Apanteles* n.sp.; *Catolaccus aeneoviridis* Gir., probably a parasite of *Apanteles*; an egg parasite, *Trichogramma minutum* Riley; and *Eupelmus popa* Gir. Insecticidal control of the pest is considered impractical. There are, however, a number of farm practices which the grower can use in controlling the pest and protecting the crop. These include timing the seeding of the crop so that most of the grain will be past the soft attractive stage before the heavy swarms of worms appear in September, disposal of the fodder and unthreshed grain heads before spring, pasturing the sorghum fields in the winter, plowing infested fields after the crop is removed in the fall or early winter, and burning fence rows and adjoining waste areas.

Observations on the susceptibility of animal fibres to damage by the larvae of two species of clothes moth, *Tineola biselliella* Hummel and *Tinea pellionella* L., R. BURGESS and E. J. POOLE (*Jour. Textile Inst.*, 22 (1931), No. 3, pp. T141-T157).—Observations on the susceptibility of animal and vegetable fibers to damage by the larvae of the webbing clothes moth and the case-bearing clothes moth led to the following conclusions:

"Vegetable fibers and silk are not attacked by the above-mentioned species of clothes moth. Certain animal fibers such as alpaca, camel's hair, cashmere, and goat hair are highly susceptible to attack, particularly when in their natural state. The natural fleece of the sheep is also readily attacked, but in the cases examined the process of scouring enhanced further its susceptibility. Partially processed sheep's wools containing vegetable oil are not favored by

clothes moth larvae, although such materials may not be considered to be immune from their activities. Fatty acids, applied in a concentration as high as 5.2 percent on the weight of wool, do not produce complete immunity. In this respect, these substances are inferior to certain mineral oils examined. Worsted cloth impregnated with solutions of "Larvex" and "Eulans" are satisfactorily proofed against the action of clothes moths. Infected wool stored in a closed atmosphere containing paradichlorobenzene is also efficiently protected."

The status of the European pine shoot moth in Connecticut, R. B. FRIEND and H. W. HICOCK (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 57-62).—In this contribution from the Connecticut State Experiment Station attention is called to the establishment of the European pine shoot moth as a serious enemy of red pine in Connecticut and its relation to forest plantings of this tree.

Observations on the tomato pin worm (*Gnorimoschema lycopersicella* Busck) and the egg plant leaf miner (*G. glochinella* Zeller) in Pennsylvania, C. A. THOMAS (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 137-143, fig. 1).—The author reports that *G. lycopersicella* was found for the first time in Pennsylvania in 1931 (E.S.R., 67, p. 50) and appears to have been eradicated there by certain greenhouse practices. A description is given of the various stages of this lepidopteran and of the injury caused by it. Notes are also given on the occurrence of the eggplant leaf miner in the same area, and on several parasites reared from its larvae.

Further notes on the bee moth, F. B. PADDOCK (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 177-181).—The author reports upon recent information obtained on the distribution, life history, and parasites of and control methods for the wax moth.

Diamond-back moth (*Plutella maculipennis* Curt.) in connection with the cultivation of mustard [trans. title], O. È. TSEDELER (*Zhur. Opytn. Agron. IUgo-Vostoka* (*Jour. Agr. Sci. S.-E. of U.S.S.R.*), 9 (1931), No. 2, pp. 165-195, figs. 5; *Eng. abs.*, pp. 194, 195).—This is an account of a study of the life history, bionomics, and control of the diamond-back moth, of particular importance in the lower Volga region, U.S.S.R., in connection with the cultivation of mustard, of which there has been an expansion in the acreage grown.

The response of corn earworm moths to various sugar solutions, L. P. DITMAN and E. N. CORY (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 109-115, fig. 1).—The authors report that corn ear worm moths responded in varying degrees to 10 sugars in solutions. On the basis of molar concentrations sucrose, invert sugar, and fructose proved most attractive in the order named.

Review of six seasons work in Louisiana in controlling the sugar cane moth borer by field colonizations of its egg parasite *Trichogramma minutum* Riley, W. E. HINDS, B. A. OSTERBERGER, and A. L. DUGAS (*Louisiana Stas. Bul.* 235 (1933), pp. 36, figs. 2).—This is a review of the control work with the sugarcane borer by the use of the egg parasite *T. minutum* commenced in 1927, with particular attention to the control tests in 1932.

"In corn, among 8 comparable check fields the natural parasitism increased between June 15 and July 30 from 17.4 to 53.5 percent average (an increase of threefold), while among 11 colonized areas averaging 16.3 percent parasitism before colonization, the addition of 6,000 *Trichogramma* per acre enabled these fields to show 82.8 percent average parasitism at the end of July (an increase to fivefold).

"Among the cane fields compared, the natural parasitism occurring at the start was 6.9 percent in all checks, 11.3 percent in all colonized, and 3.3 percent in all adjacents which received most of their parasite supply from nearby,

colonized cornfields. In 3 weeks the percentage had increased fivefold in colonized, fivefold in adjacent, and threefold in check areas. Through the balance of the season the parasitism in colonized and adjacent areas continued far higher than in the checks, averaging approximately 28 percent above checks to September 10.

"Correlation studies show that in all check areas there was an average of 31.8 percent of the cane joints bored and a moth population of 6,057 produced in millable cane through the season. Compared with these figures, all colonized fields showed 13.5 percent of joints bored and 3,422 moths per acre, while adjacent fields had 12.3 percent of joints bored and 2,164 moths per acre.

"With an initial total stand averaging 34,880 sprouts in all 31 protected areas and 35,720 in 28 checks, there were 19,289 millable stalks per acre produced in checks and 25,288 in all protected areas. The difference of 6,000 millable stalks per acre, or a saving of over 30 percent of the check stalk yield, is indicated as one benefit from colonization work. We find a consistent and very significant saving in pounds of sugar produced per ton of cane. The saving ranged from 6.52 lb. per ton with 807 (the most resistant variety) to 25.83 lb. per ton with 213. The general average saving shown as a composite of all varieties was 20.92 lb. of sugar per ton of cane.

"The cost of colonization work averaged \$1 per acre in 1932. The six sets of plantation records secured in 1932 showed an average yield of 15.63 tons per acre in six check areas with natural parasitism and 18.91 tons in six protected areas. The average saving or gain in yield was 3.28 tons per acre. In these six fields there was an average increase of 22.38 lb. of sugar per ton of cane produced as compared with 20.92 lb. for all of our test areas as measured by field samples. The gross value of the increased yield of sugar per acre in six protected areas at 3 c. per pound was \$29.04 per acre."

Sugarcane borer control by *Trichogramma* colonization in Louisiana in 1932, W. E. HINDS, B. A. OSTERBERGER, and A. L. DUGAS (*Sugar Bul.*, 11 (1933), No. 7, pp. 2, 4).—This is a general statement of the results of and conclusions drawn from work with *T. minutum* colonization in 1932, contributed from the Louisiana Experiment Stations (E.S.R., 67, p. 156), the details of which are above noted.

"Our general conclusion from all of this work is that *Trichogramma* colonization, as tested by experiment station workers and practiced by numerous growers in 1932, resulted in a very substantial reduction in cane borer multiplication and damage to sugarcane and a corresponding increase in tonnage of millable cane and in the amount of sugar produced per ton of cane."

Further investigations on the racial differentiation of *Anopheles maculipennis* in the Netherlands and its bearing on malaria, A. DE BUCK, E. SCHOUTE, and N. H. SWELLENGREBEL (*Riv. Malariol.*, 11 (1932), No. 2, pp. 137-156, pl. 1, figs. 2; *Ital., Fr., Eng., Ger. abs.*, pp. 265, 267, 269, 271).—In this contribution (E.S.R., 64, p. 159) the authors confirm earlier findings as regards different sexual habits and morphological differences in the two races of the malaria mosquito *A. maculipennis*.

Notes on the infectivity, food, and breeding waters of anophelines in Kenya, C. B. SYMES (*Kenya Med. Dept., Rec. Med. Res. Lab.*, No. 4 (1932), pp. 28, pl. 1).—In this report of observations much of the data is presented in tabular form.

The problem of mosquito control in Delaware, L. A. STEARNS, D. MCCREARY, and N. P. NEWHOUSE (*Delaware Sta. Bul.* 181 (1933), pp. 106, figs. 31).—Following a brief introduction, the authors take up the outstanding features of the survey made during the months of May to September, inclusive, in 1932

for 16 representative communities throughout the State, survey objectives, investigational procedure, a summary of trap collection records, community surveys (pp. 21-65), summary of mosquito breeding in 1932 (pp. 66-69), biology of the species of mosquitoes collected during 1932 (pp. 70-89), topography of the State in relation to its mosquito control problem (pp. 90-94), the general problem of mosquito control (pp. 94-97), problem of mosquito control in Rehoboth area (pp. 97-102), and organization for mosquito control in Delaware (p. 102).

Records of the mosquito fauna in the several localities in which nightly samples were made of the mosquito fauna by means of a mechanical collecting device, and including a total of 98,922 adult mosquitoes, indicate that at least 28 species comprise the mosquito population of the State. On a percentage basis, the saltmarsh group of mosquitoes (saltmarsh mosquito, brown saltmarsh mosquito, *Aedes taeniorhynchus* Wied., and *Culex salinarius* Coq.) constitutes 41 percent and the house mosquito (*C. pipiens* L.) 36 percent of the total mosquito population of the State. With these five species responsible for approximately three fourths of the annoyance experienced, an additional five species, *A. vexans* Meig. (the inland swamp mosquito), *Mansonia perturbans* Walk., and the three anophelines *Anopheles quadrimaculatus* Say (the malarial mosquito), *A. crucians* Wied., and *A. walkeri* Theob., contribute largely to the remaining one fourth.

The present data indicate conclusively that freedom from the mosquito nuisance throughout a greater part of the State depends largely upon the control of the saltmarsh group of mosquitoes through the elimination of those areas in which they are bred. These species constitute from 74 to 89 percent of the total mosquito population of Milton, Bethany Beach, Rehoboth Beach, Dover, and Lewes and of adjoining areas. The saltmarsh areas of the State comprise a total of 107,456 acres. Adequate treatment would necessitate large-scale operations, including ditching, diking, hydraulic fill, flooding, etc.

Mosquitoes kill live stock, F. C. BISHOPP (*Science*, 77 (1933), No. 1987, pp. 115, 116).—An outbreak of the mosquito *Psorophora columbiae* Dyar and Knab in Florida, which resulted in the death of at least 173 head of livestock and poultry, including 80 cattle, 67 hogs, 3 horses, 1 mule, 20 chickens, and 2 dogs, is recorded. It is thought that death may have been due to injection of a toxin by the mosquitoes as well as to the loss of blood.

Observations on the Mexican fruit fly and some related species in Cuernavaca, Mexico, in 1928 and 1929, M. MCPHAIL and C. I. BLISS (*U.S. Dept. Agr. Circ. 255* (1933), pp. 24, figs. 6).—A report of observations, particularly of the Mexican fruit fly (officially known as the orange maggot), conducted during parts of the seasons 1928 and 1929 in the heavily infested region in and about Cuernavaca, Morelos, south of México, D.F. The fly bred most abundantly in mango and throughout the year it occurred in smaller numbers in sweet lime, orange, peach, and pomegranate, and occasionally in guava, but because of the frequency of off-season mangoes none of these was an essential alternate host. Guavas were infested normally by the Central American fruit fly (*Anastrepha striata* Schin.), a species which seldom occurred in other fruits. A third species, the West Indian fruit fly, occurred in smaller numbers almost entirely in the yellow mombin, or native "plum".

"Parasitism was confined largely to *Opius crawfordi* Vier., which laid its eggs in the infested mangoes. Parasitized larvae formed apparently normal puparia, from which adult parasites emerged about a day and a half later than did unparasitized flies. The parasite seemed to attack older larvae of *A. ludens* more successfully than younger ones. The percentage of parasitism varied with the season, increasing rapidly as the mangoes ripened, from 1.4 percent in April to 27.8 percent in June in dropped fruits. Three other parasites

have been reared from fruit-fly pupae in small numbers: *Galesus* sp., *Eucolia* sp., and *Anthrax scylla* O.S."

Results of dusting experiments to control the blueberry maggot, L. C. McALISTER, JR. (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 221-227).—Experiments conducted during 1931 demonstrated that two applications of calcium arsenate will produce blueberries free from the blueberry maggot under conditions of moderate infestation, although the insect may not be completely eradicated. "Three applications of calcium arsenate will further reduce the maggot infestation, but there is increased danger of excessive arsenical residue. One application of calcium arsenate was found to be inadequate under ordinary circumstances. The calcium arsenate may be diluted with an equal quantity of hydrated lime and remain effective. Copper carbonate used as a dust in one field test reduced the number of maggots 97.11 percent."

The use of blowfly maggots in the treatment of osteomyelitis and certain other diseases, W. ROBINSON (*U.S. Dept. Agr., Bur. Ent.*, 1932, pp. 2).—A brief account, in multigraphed form, of the use made of blowfly maggots in the treatment of surgical osteomyelitis.

The rearing of blowflies and the culture of sterile maggots for use in osteomyelitis, W. ROBINSON (*U.S. Dept. Agr., Bur. Ent.*, 1932, pp. 8).—An account in multigraphed form is given of the essential features of the life history and habits of blowflies, general methods of rearing adults and maggots, the technic applied in the production of sterile maggots, and the entomological aspects of the maggot treatment for surgical osteomyelitis.

Surgical maggots in the treatment of infected wounds: Culture of sterile maggots, W. ROBINSON (*Jour. Lab. and Clin. Med.*, 18 (1933), No. 4, pp. 406-412).—This contribution is accompanied by a list of 22 references to the literature.

An efficient medium for rearing houseflies throughout the year, H. H. RICHARDSON (*Science*, 76 (1932), No. 1972, pp. 350, 351).—In studies made of the rearing of large numbers of house flies continuously throughout the year for use in various lines of research, it was found that a wheat bran-alfalfa meal mixture, supplemented with small amounts of yeast and Diamalt (a commercial product composed of a large percentage of malt sugar), provided a very satisfactory larval medium. The formula found most satisfactory for this medium consists of (1) wheat bran 3.25 lb. and alfalfa meal 1.75 lb., thoroughly mixed, and (2) water 5,000 cc, yeast suspension 300 cc, and Diamalt 25 cc, also thoroughly mixed together. The water mixture should be added to the bran mixture and thoroughly stirred, following which the house fly eggs may be added immediately.

Preliminary report on controlling the winter emergence of the Japanese beetle in rose greenhouses by application of chemicals to the soil, F. W. METZGER (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 205-210, fig. 1).—This contribution reports upon preliminary results obtained in an effort to control the injury to roses in greenhouses caused by Japanese beetles emerging during the winter months and feeding on the plants, through treating beds containing five varieties of roses with various materials.

"Lead arsenate and barium fluosilicate used at the 3,000-lb. rate gave practically 100 percent control, but as the latter material was used at only one concentration no comparison of the lower rates can be made." Further data are considered necessary to determine the practical value of the treatments.

Japanese beetle (*Popillia japonica*), R. HUTSON (*Michigan Sta. Quart. Bul.*, 15 (1933), No. 3, pp. 166-168, fig. 1).—A brief practical account.

Present status of two Asiatic beetles (*Anomala orientalis* and *Autoserica castanea*) in the United States, H. C. HALLOCK (*Jour. Econ. Ent.*, 26 (1933),

No. 1, pp. 80-85, pls. 3, figs. 2).—The author considers the distribution and importance of the Asiatic beetle and the Asiatic garden beetle *Autoserica castanea* Arr. in the United States. An account of the life history and control of the latter pest by the author has been noted (E.S.R., 68, p. 791).

Observations on the biology and control of *Metriona bivittata* Say, L. A. STEARNS (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 151-154, pls. 2).—The author reports upon a localized but destructive outbreak of the two-striped sweetpotato beetle *M. bivittata* near Laurel, Del., in 1932, further demonstrating the ability of this species to effect extensive damage. "At the height of the infestation, during the first week in July, a tachinid, *Anetia dimmocki* Ald., was responsible for a 12 percent larval parasitism. The results of a single application on July 6, to severely affected areas, of lead and calcium arsenates, in dust form undiluted, indicate that both materials were practically 100 percent effective for control of this insect and caused but slight injury to the plants. The acreage so treated on that date showed subsequently an almost complete recovery and produced a satisfactory crop."

Cultural practices in relation to Mexican bean beetle control, N. TURNER and R. B. FRIEND (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 115-123, figs. 4).—In this contribution from the Connecticut State Experiment Station the effect of spacing of bean plants on injury by the Mexican bean beetle and on the efficiency of control measures is discussed.

Insecticides for the control of the Mexican bean beetle, N. F. HOWARD, L. W. BRANNON, and H. C. MASON (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 123-129).—Field tests which have extended over a period of 3 years indicate that potassium hexafluoroaluminate and synthetic cryolite are satisfactory for the control of the Mexican bean beetle when used as sprays at the rate of 3 lb. to 50 gal. of water. "Barium fluosilicate (80 percent) must be used at the rate of 5 lb. to 50 gal. of water to give satisfactory control, and is considered too expensive to be recommended. These compounds have not given satisfactory control when used as dusts. There appears to be no advantage in changing current recommendations for the use of magnesium arsenate except that the dosage should be increased from 1 lb. to 2 lb. to 50 gal. of water where the infestation is heavy. If fluorine compounds are used, the problem of poisonous residues on green beans is not avoided, and green beans should not be sprayed with any of the above compounds after the pods have set."

***Oides decempunctata* (Billberg), a chrysomelid pest of cultivated grape (*Vitis lambrusca* Linn.), W. E. HOFFMANN** (*Lingnan Sci. Jour.*, 11 (1932), No. 4, pp. 565, 566, pls. 2).—A brief account is given of a chrysomelid which attacks cultivated grape in the vicinity of Canton.

Barium fluosilicate as a control for the tobacco flea beetle, F. S. CHAMBERLIN (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 233-236).—This is a report of experimental work with barium fluosilicate in combating the tobacco flea beetle on shade-grown tobacco in Georgia and Florida.

Chloropicrin as a soil insecticide for wireworms, M. W. STONE and R. E. CAMPBELL (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 237-243).—Experiments in California with chloropicrin in dilute solutions have shown that it is toxic to wireworms, but that its use on a large scale would be very expensive.

Field experiments with various poison baits against wireworms, *Limonius* (*Pheletes*) *canus* Lec., R. S. LEHMAN (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 243-252).—The results obtained from the use of some 125 organic and inorganic compounds at different concentrations in ground whole-wheat baits in combating the wireworm *L. (P.) canus* are presented in tabular form. Arsenic compounds were found to be definitely repellent. Paraphenylenedia-

mine was the only compound which showed any promise as an effective poison in these baits.

The vegetable weevil (*Listroderes obliquus*), O. H. LOVELL (*California Sta. Bul.* 546 (1932), pp. 19, figs. 6).—The vegetable weevil has been known to occur in California about the San Francisco Bay region since 1926 and is now found in 11 counties in the State. It is active throughout the fall, winter, and spring months. "The larva does considerable damage to truck crops, especially carrots, turnips, and spinach, in the fall and winter, while the adult does most of its damage to tomatoes and potatoes in the late spring and early summer. After June the weevil goes into estivation and remains inactive until September.

"The vegetable weevil is best controlled by dusting infested carrots, turnips, and spinach with either sodium fluosilicate or barium fluosilicate of 70 to 80 percent strengths at the rate of 30 to 40 lb. of dust per acre when the foliage is dense and at the rate of 15 to 25 lb. when the foliage is thin. The dust should be evenly distributed. It is best done by a rotary duster with a fanshaped nozzle. For larger acreages a power duster is most efficient. For the control of the weevil on young tomato plants a knapsack, or bellows, duster is recommended. A puff or two to each plant, or enough to cover thoroughly the foliage and the ground at the base of the plant, will give the plants protection; 10 to 12 lb. per acre is sufficient."

Field sanitation is next in importance in reducing the damage due to attack by this pest. Crop rotation and thorough cultivation are other means of reducing the weevil population and should be used when possible. Poison baits may also be used to advantage in some instances.

A cage for confining weevils on the fruit and foliage of trees, T. L. BISSELL (*Jour. Econ. Ent.*, 26 (1933), No. 1, p. 176).—A description is given of a simple cage which has proved satisfactory for caging adults of the pecan weevil on growing nuts and foliage for insecticide tests.

Life history and distribution of the low-tide billbug, *Calendra setiger* (Chittenden), A. F. SATTERTHWAIT (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 210-217).—This is a report of a study of *C. setiger*, which breeds, so far as known, chiefly below high tide mark in salt reed grass (*Spartina cynosuroides*) in maritime marshes along the Atlantic coast.

"Reared indoors and in corn pith, larvae developed essentially in the same number of instars and in the same period of time as do species commonly attacking corn. A careful study of the immature stages indicates that the egg stage approximates 5 days, the larval stage 45 days for the 6-instar larvae and 51 days for the 17-instar larvae, and the pupal stage 10 days. Measurements of eggs, head widths of larvae, and pronotal widths and total lengths of pupae have been recorded. Beetles reared from eggs laid in captivity were healthy, wintered successfully, matured, and laid eggs from which a second generation of adults was reared.

"This billbug's ability to adapt itself immediately to corn tissue and to a complete absence of sea water indicates its potentiality as a corn destroyer in the event that any sod land infested by it is directly converted to a cornfield. In its larval and adult stages it is known to feed on salt reed grass, which is used to some extent as a wild hay."

Some observations on *Hylobius pales* Herbst, H. H. YORK (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 218-221, pl. 1).—These observations relate to a weevil which works in stumps and at the root crown of pitch pine and white pine in several localities in New York State.

The biology of *Opius melleus* Gahan, a parasite of the blueberry maggot, F. H. LATHROP and R. C. NEWTON (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 2,

pp. 143-160, figs. 6).—This is a report of studies of the biology of *O. melleus* made during the course of investigations of the blueberry maggot in eastern Maine from 1925 to 1929, inclusive. Records of adults captured in emergence cages indicated parasitism of the blueberry maggot by *O. melleus* ranging from 1.37 to 29.66 percent. Examinations of the puparia indicated parasitism ranging from 3.28 to 49.42 percent.

A thorough study of the problem has shown that the determination of the percentage of parasitism of isolated samples does not indicate the effective seasonal parasitism by *O. malleus*. The most accurate estimate of the total seasonal parasitism was made by plotting the seasonal populations of maggots of the third instar and of parasites, and comparing the areas enclosed by the respective curves. The percentage of parasitism alone, however, does not necessarily indicate the potential value of the parasite in reducing the population of the blueberry maggot, for a number of other factors, such as relative rates of reproduction and ecological competition, must be taken into consideration. It appears that this parasite is not actively reducing the population of the blueberry maggot, and that it will probably never have this effect unless some marked change in the environment of the species should occur. It seems clearly indicated, however, that this parasite is an important ecological factor in the balance which apparently exists in the blueberry maggot association.

The female parasite deposits the egg directly into the body of the maggot, the egg hatching within from 3 to 6 days. The parasite larva swims freely in the body cavity of the maggot, without injury to the host until the host puparium is formed. Larvae may be found in the maggots from early August until frost occurs, usually in late September or early October. Laboratory studies indicated that the average length of life of the adult parasite was 17.5 days, with no significant difference in the longevity of males and females. The simultaneous study of data from field counts and the emergence records indicates an average length of life of approximately 20 days.

The interrelations of two hymenopterous egg parasites of the gipsy moth, with notes on the larval instars of each, D. L. PARKER (*Jour. Agr. Res.* [U.S.], 46 (1933), No. 1, pp. 23-34, figs. 6).—This is a report of observations of the interrelations of *Anastatus disparis* Ruschka and *Ooencyrtus kuvanae* (How.), two important hymenopterous egg parasites of the gipsy moth which have become well established over a considerable part of the area of New England infested by this moth.

It appears that there is little serious competition between the two parasites. While *O. kuvanae* females can attack a host egg containing *A. disparis* from the time this insect is in the egg stage until it has become an early third-instar larva, *A. disparis* does not suffer from the attack. An egg containing *O. kuvanae* throughout its egg, larval, and pupal life is to some extent susceptible to attack by *A. disparis*, but except for successful oviposition while *O. kuvanae* is in the egg stage, which results in *A. disparis* developing, neither of the parasites succeeds in completing development. Since there is little conflict between the parasites in the same area under the conditions simulated in the experiments, the presence of the two may be considered advantageous, for parasitism by *O. kuvanae* affords additional control to that effected by *A. disparis*. *A. disparis*, however, is the preferred parasite (1) because it is a single-generation parasite having a life history which coincides very closely with that of the host itself and (2) because it hibernates successfully in the area of New England infested by the gipsy moth. *O. kuvanae* is multiple brooded and depends largely upon infertile and killed host eggs for the early spring generation. It hibernates as an adult, and suffers great losses during the winter months.

In the course of the investigations it was noted that, contrary to the general belief, there are five rather than three larval instars in the case of both the parasites. Short descriptions of the larvae are given, and the larval mandibles of both parasites are illustrated.

The new beekeeping, E. F. PHILLIPS (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 155-162).—This is a discussion of developments in practical beekeeping methods based on investigations and experience regarding the need of colonies of bees in winter and spring, special attention being given to the size and arrangement of the hive. The 2-story Langstroth hive is advised for winter, the upper story being filled with honey.

Nectar secretion of the tuliptree or yellow poplar, G. E. MARVIN (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 170-176, fig. 1).—A study of the quantity of nectar secreted per blossom of the yellow poplar and the sugar content of this nectar has shown the average weight of nectar secreted by one flower to be 1.6417 g. The average sugar content of nectar from freshly opened blossoms was 16.7 percent. After the flower was open, the concentration of the nectar increased until on the second day it reached 35.9 percent. The tree under observation was calculated to yield sufficient nectar to produce 2.16 lb. of honey.

Studies on the rate at which honeybees ripen honey, O. W. PARK (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 188-193, fig. 1).—In this contribution from the Iowa Experiment Station the author reports that "nectar containing 45 percent sugar when brought into the hive was found to contain approximately 60 percent sugar when first deposited in the comb. Other results show that combs of green honey left in the hive but screened from the bees advanced in concentration from 65 percent to 80 percent, the concentration of ripe honey, within 3 days."

Buckeye poisoning of the honeybee.—A progress report, J. E. ECKER (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 181-187).—This is a progress report of work with buckeye poisoning of the honeybee, contributions on which by Vansell et al. have been noted (E.S.R., 55, p. 56; 67, pp. 720, 721).

Preliminary observations on "paralysis" of honeybees, C. E. BURNSIDE (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 162-168).—The author reports upon experiments in which "paralysis" appeared to be successfully transmitted among bees in cages and among bees in colonies. "Brood from affected colonies when placed in healthy colonies produced bees which remained healthy. Conversely, brood from healthy colonies when placed in affected colonies produced bees many of which were later affected by paralysis. The results obtained seem to indicate that paralysis of adult honeybees is a slightly infectious disease that is transmitted directly from sick or dead bees to healthy ones."

A plant poisonous to adult bees, G. H. VANSSELL and W. G. WATKINS (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 168-170).—A brief account of the poisoning of bees moved into the Sierra Nevada Mountains of California in 1932 while visiting the blossoms of western false hellebore (*Veratrum californicum*).

Efficiency and economy in apiary inspection, R. G. RICHMOND (*Jour. Econ. Ent.*, 26 (1933), No. 1, pp. 194-196).—A description of a method of organization for apiary inspection suitable for present economic circumstances which has been applied in Colorado and found entirely satisfactory.

Chemical control of the garden centipede, *Scutigera immaculata*, A. E. MICHELbacher (*California Sta. Bul.* 548 (1932), pp. 19, fig. 1).—In experiments with chemicals for control of *S. immaculata* (Newp.), accounts of which pest by Wymore in California (E.S.R., 66, p. 456), Filing in Ohio (E.S.R., 66, p. 253), Riley in Indiana (E.S.R., 61, p. 663), and others have been noted,

carbon disulfide, carbon disulfide emulsion, carbon tetrachloride, chloropicrin, and calcium cyanide killed rapidly, with at least the first three exerting their fullest killing power during the first 24 hours. Paradichlorobenzene and naphthalene appeared to kill rather slowly, with the lethal action of paradichlorobenzene lasting until apparently all the centipedes are killed.

"Of the chemicals experimented with, the only ones that showed promise in the control of the garden centipede were paradichlorobenzene, carbon disulfide, and carbon disulfide emulsion, when the rate of application was heavy enough. While carbon disulfide emulsion did not give good results when used in the experimental plats, it has given satisfactory control under certain greenhouse conditions. It is effective only when the centipedes are concentrated near the surface of the soil and the soil is loose, porous, and moist so that the emulsion penetrates it readily. Paradichlorobenzene proved effective when used at the rate of 600 and 900 lb. per acre. This chemical should be applied only in the summer when the soil temperature is high, if effective control is to be obtained. Carbon disulfide proved effective when used at the rate of 145 and 290 gal. per acre. The effectiveness of the 145-gal. treatment is believed to be due to the fact that it was applied under most favorable conditions. Paradichlorobenzene and carbon disulfide are both injurious to vegetation and, therefore, their use is mostly limited to areas free of growing plants. Carbon disulfide emulsion has an advantage over the above-mentioned chemicals in that it can be applied to many different kinds of plants without causing injury to most of them.

"Because of cost, chemical control of the centipede under field conditions will probably prove uneconomical in most cases, although on small areas and in greenhouses such treatment may be profitable."

ANIMAL PRODUCTION

[**Experiments with livestock in Alaska**], W. T. WHITE (*Alaska Stas. Rpt. 1931-1932, pp. 19-22*).—Studies at the station have produced results noted on the feeding and breeding of Galloway-Holstein cows for milk production, the feeding and management of brood sows, carcass tests with yak-Galloway hybrids, the making of silage from sliced potatoes and freshly cut hay, and mosquito repellents for cattle on pasture.

[**Investigations with livestock in California**] (*California Sta. Rpt. 1932, pp. 13-15, 18-21*).—In tests with sheep results are reported on fattening rations for lambs, effects of plane of nutrition on various factors related to wool, amount of yolk in wool, suitability of branding fluids, and the value of rams of five different breeds for producing market lambs.

Swine studies were concerned with inbreeding Berkshire hogs, the value of whey for feeding with various feeds, casein as a feed for hogs, relation of diet to changes in the blood calcium, and relation of barley to leg stiffness in swine.

The poultry experiments have yielded information on supplying vitamins to poultry, yeast for correcting egg production and mortality during the pullet year, protein analyses of commercial fish and meat scraps, a comparison of wheat and barley for laying birds, the value of grit in poultry rations, the cause of watery whites in eggs during storage, inheritance of egg quality and of feather characters, pedigree breeding of turkeys, sex determination in chicks, and size and position of embryos.

[**Experiments with livestock in Delaware**] (*Delaware Sta. Bul. 179 (1932), pp. 21, 22, 23-25*).—Experiments with hogs have yielded information on protein

supplements for hogs, winter rations for brood sows, and forage crops for swine, all by A. E. Tomhave.

The poultry studies report data on the utilization of ground soybeans for poultry, rations for growing pullets, germinated oats for laying birds, and confinement of laying birds without succulent green feed, all by Tomhave and C. W. Mumford.

[Investigations with livestock in Indiana] (*Indiana Sta. Rpt. 1932, pp. 22-24, 49-52, 56, 57, 59, 60, figs. 3*).—Results obtained in studies with swine are reported on hogging-off wheat, vegetable proteins as satisfactory supplements, protein supplements to corn for hogs on pasture, improving a corn-soybean ration for hogs, shrinkage of hogs en route to market, trends in Chicago hog prices, and anemia in pigs.

The sheep studies report information on causes of cull lambs, grain requirements of suckling lambs, and oats for sheep and lambs.

In the poultry work data are reported on the effectiveness of rations composed largely of wheat on young chicks, ground grains in laying mash, and condensed buttermilk for layers; cooperative shipping of eggs; the proportions of meat scrap and dried milk in rations for chicks; liquid and condensed milk for chicks; oats as a substitute for bran and middlings in rations for chicks; protein requirements of growing pullets; confinement v. limited range and grain and mash v. all mash for turkeys; and poultry housing experiments.

Nutrition and other experiments reported data on the chemical and biological evaluation of protein concentrates, a study of the nutritive value and mineral deficiencies of soybeans and soybean products, and determining suitable rations for fattening cattle on the basis of availability and price of feeds.

[Investigations with livestock in Iowa] (*Iowa Sta. Rpt. 1932, pp. 18-24, 26-30, 47, fig. 1*).—In studies with beef cattle results are reported on protein supplements and a simple mineral mixture for fattening calves, by C. C. Culbertson; and the influence of sex upon the quality and palatability of beef from calves and yearlings, by M. D. Helser, Culbertson, B. H. Thomas, and P. M. Nelson.

Swine studies were concerned with the consequences of inbreeding Poland China hogs, by J. L. Lush and Culbertson; outbreeding v. crossbreeding with swine, by P. S. Shearer and Culbertson; the relative efficiency of different sources of calcium for growing and fattening spring pigs in dry lot, by Culbertson and Thomas; swine performance record, by Culbertson, Helser, and Thomas; value of yeast and prepared yeast feeds for fattening pigs on rape pasture, and efficiency of high- and low-protein supplemental feeds for gilts, both by Culbertson; and the relative efficiency of different types of corn for growing and fattening pigs, by Culbertson and J. L. Robinson.

The poultry work included data on the biological value of meat scrap and milk combinations for egg production, and egg yolk and chicken fat as preventives of rickets and slipped tendons of chicks, both by E. W. Henderson; the association of the date of hatch, date of first egg, and maturity with egg production, and the influence of selection and breeding upon egg production and maturity, both by N. F. Waters and Henderson; the effect of inbreeding, linebreeding, outbreeding, and crossbreeding, by Waters and W. V. Lambert; and a comparison of avian growth rates, by Henderson and R. L. Cochran.

Other studies were concerned with inbreeding and other breeding practices used in producing the pure breeds of livestock, by Lush; the preparation of roughages for draft colts, by A. B. Caine; and the development and cure of nutritional anemia in lambs, by Thomas.

[Experiments with livestock] (*New York Cornell Sta. Rpt. 1932, pp. 103, 104, 105, 106-109, 110, 155, 156*).—Nutrition studies have yielded information

on the influence of undigested residues upon the growth and well-being of the animal body, by C. M. McCay, H. Morgan, J. C. Woodward, and S. A. Asdell; the nutritional requirements of trout, by McCay and A. V. Tunison; the vitamin content and protein efficiency of various fish meals, by L. A. Maynard, Tunison, and L. C. Norris; and the nutritive value of proteins of alfalfa and clover hay, by F. B. Morrison, Maynard, and K. L. Turk.

Studies with sheep report data on the relation of feeding and management to the "stiff lamb" trouble, by J. P. Willman, Asdell, W. T. Grams, and W. A. Hagan; the effect of castration and docking upon the gains and the carcasses of male lambs, by R. B. Hinman, Willman, and C. D. Schutt; methods of fattening western lambs, by Willman and Morrison; and a comparison of various instruments for docking lambs, by Willman.

With poultry results are reported on the requirement of chicks for the vitamin G complex, by Norris, A. T. Ringrose, V. Heiman, and G. F. Heuser; the calcium requirement of laying hens, by Norris, Heuser, and Ringrose; and the production of clean market eggs, by A. Van Wagenen and A. L. Dean.

Other studies were concerned with the protein requirements of the work horse, by M. W. Harper, and the prevention of anemia in suckling pigs, by Willman, McCay, and B. O. Gormel.

[**Animal husbandry investigations in Ohio**] (*Ohio Sta. Bul.* 516 (1933), pp. 79-81, 82, 83, 84-88, 89, 90, 109, 110, 111, 112).—Preliminary results of studies with sheep are reported on timothy hay in the winter ration of ewes and roughages for fattening lambs, by D. S. Bell, L. E. Thatcher, and C. H. Hunt.

Swine studies include notes on a comparison of ear corn and shelled corn for pigs, grinding oats for pigs, methods of feeding oats to pigs on pasture, finishing limited-fed pigs in dry lot, salmon oil as a source of vitamin D for pigs, and molasses for pigs, all by W. L. Robison; the effect of fluorine on reproduction and lactation in swine, by C. H. Kick and R. M. Bethke; hogging down wheat, by Robison and P. A. Jones; and limitations of soybeans for pigs, by Robison and H. W. Rogers.

The poultry researches offer information on pullets from hen v. pullet eggs, and the effect of management during growth on laying pullets, both by D. C. Kennard and V. D. Chamberlin; the vitamin G requirements of chicks, by Bethke and P. R. Record; nutritional factors affecting the hatchability of eggs, by Bethke, Record, and Kennard; the effect of certain milk rations upon the hydrogen-ion concentration of the intestinal contents of domestic fowls, by [D. W.] Ashcraft; winter eggs from hens, by Kennard and L. A. Malik; and unhulled oats v. oat feed for layers, by Kennard and S. C. Hartman.

Analyses of the vitamin B and G and protein content of alfalfa and timothy hays cut at various stages, by Hunt, Bethke, O. H. M. Wilder, and Bell, are included.

Inspection of commercial feeding stuffs, 1932, T. O. SMITH and S. J. FISHER (*New Hampshire Sta. Bul.* 268 (1932), pp. 48).—The usual report of the guaranteed and found analyses of samples of 283 brands of feeding stuffs collected for official inspection during the year ended June 1932 (E.S.R., 66, p. 762).

Inspection of feeds, W. L. ADAMS and A. S. KNOWLES, JR. (*Rhode Island Sta. Ann. Feed Circ.*, 1932, pp. 12).—This is the usual report of the guaranteed and found analyses of protein and fat of 219 samples of feeding stuffs collected for official inspection in 1931 (E.S.R., 65, p. 553).

Commercial feeding stuffs, September 1, 1931, to August 31, 1932, F. D. FULLER and J. SULLIVAN (*Texas Sta. Bul.* 467 (1932), pp. 222).—This report deals with the chemical analyses and microscopical examination of

2,909 samples of feeding stuffs collected for official inspection (E.S.R., 66, p. 762).

Creep-feeding range calves, J. M. and J. H. JONES (*Texas Sta. Bul.* 470 (1932), pp. 12, figs. 2).—In cooperation with the U.S.D.A. Bureau of Animal Industry a study was undertaken to determine the advisability of creep-feeding calves on Texas ranches. A group of 118 grade Hereford cows and their steer calves were divided into two comparable groups and were placed in separate pastures. The creep-fed lot consisted of 69 calves and their dams, and the average initial weight of the calves was 272.6 lb. During the first 43 days of the test the cows and calves both had access to a grain mixture of ground milo heads and cottonseed meal 4:1. After this period the cows were excluded from the creep. During the second part of the feeding period ground ear corn replaced the milo heads. The calves were fed during the suckling period and for a period of 86 days following weaning. The second lot consisted of 49 calves, averaging 275.4 lb. per head, and their dams.

The creep-fed calves gained 114 lb. more per head during a period of 160 days than did those not creep fed, and after weaning gained 119 lb. more per head in 86 days than did the unfed calves. At weaning time the creep-fed calves were worth 0.5 c. per pound more than the unfed calves and at the end of both feeding periods returned \$3.92 more per head than the unfed calves. The cost per 100 lb. of gain for creep feeding was \$2.36 and \$4.21 during the respective periods. The cows in the creep-fed lot gained 80 lb. per head as compared with 29 lb. per head for the cows in the second group during the suckling period.

Calves from old cows made larger gains in creeps but smaller gains on grass than calves from young cows. Calves that weighed less than 250 lb. initial weight gained 9 lb. more during the suckling period than calves weighing more than 250 lb., but there was no difference in the gains of the two classes during the second part of the feeding period.

Feeding tests and carcass studies with early spring lambs and aged western ewes, A. D. WEBER and W. J. LOEFFEL (*Nebraska Sta. Bul.* 276 (1932), pp. 31, figs. 5).—In an effort to determine the minimum amount of grain that may be fed to aged western ewes to produce choice early lambs, three lots of 50 ewes each were fed as follows: (1) A heavy grain ration before and after lambing, (2) no grain before and liberal grain after lambing, and (3) no grain before or after lambing. Approximately the same amount of cottonseed meal and alfalfa was fed in all lots, and corn silage was fed in amounts that the animals would clean up. Ground ear corn was fed at the levels indicated above. The experiment also included a study of the quality and palatability of the carcasses of the ewes fed grain before and after lambing and to determine the effect of weaning on the quality and palatability of lamb carcasses.

The ewes in lot 1 gained 25 lb. more per head before lambing than the ewes in lots 2 and 3, but all lots lost weight after lambing. There were more cases of difficult lambing in lot 1 than in the other lots. The lambs in lot 3 were normal in all respects at birth. There was a distinct relationship between the amount of grain fed to the ewes and the gains made by the lambs before weaning. Only the ewes in lot 1 sold at top prices at the time the lambs were weaned, and the ewes in lot 3 were considerably thinner at weaning time than at lambing time. The results indicate that the condition of the ewes at the close of the breeding season should determine the amount of grain to feed before lambing.

Creep-fed lambs weaned at 3 months of age made good gains when continued on full feed for 28 days. The carcasses of such lambs at weaning time weighed

34 lb. and after an additional 28 days' feeding weighed 41 lb. There was little difference in the two groups in dressing yield or carcass grade, and no noticeable difference in cutting yields. Full feeding for 28 days after weaning slightly increased the yield of internal fat and reduced somewhat the kidney fat, but chemical analyses showed no loss of fat for the entire carcass. The roasts from weanling lambs were a little less pronounced in aroma and flavor of fat and lean but more tender and juicy than roasts from lambs fed for 28 days.

The ewes in lot 1 dressed 50 percent when slaughtered at the time the lambs were weaned. The carcasses of these ewes were graded "good" and were thickly but rather unevenly covered. The flesh from the racks contained 48 percent fat. Roasts from such carcasses had a pronounced but not necessarily an undesirable aroma. When compared with lamb the roasts had a more pronounced and less desirable flavor of both fat and lean, were slightly dry, and not particularly tender.

Fattening lambs in sugar beet districts, W. L. QUAYLE (*Wyoming Sta. Bul. 191* (1932), pp. 43, figs. 4).—Feeding tests were conducted at the Torrington Substation for 7 years and at the Worland Substation for 9 years. At the former place lambs varying in initial weight from 56 to 70 lb. were fed for periods ranging from 80 to 100 days, while at the latter place the lambs varied in weight from 53 to 70 lb. and the feeding periods ranged from 78 to 100 days.

The combined results of these tests showed that the addition of cottonseed cake to a ration of corn and alfalfa increased the rate of gain, but was not usually economical. The same was true when cottonseed cake was added to a ration of barley, wet beet pulp, and alfalfa. The rate of gain was the same when either cottonseed cake or barley was fed with alfalfa, but the cost was higher with the former feed.

Reducing the corn allowance to one fourth and allowing wet beet pulp and alfalfa ad libitum resulted in smaller gains than a full ration of corn and alfalfa. Adding 0.25 lb. of corn to a ration of wet beet pulp and alfalfa increased the rate of gain about 12 percent, but the gain was only slightly better than when the same amount of barley was fed. Adding corn to the above ration produced about four times as many fat lambs as the wet pulp and alfalfa ration alone. When fed with cottonseed cake and alfalfa, both corn and dried beet pulp produced the same gain with practically no difference in feed required per unit of gain. Corn made slightly better gains when fed with alfalfa than with barley, and the latter feed was 87 percent as efficient as the corn. Replacing half the corn with wheat and feeding with cottonseed cake and alfalfa reduced the rate of gain 3 percent and increased the feed required per 100 lb. of gain.

With cottonseed cake and alfalfa, barley produced smaller gains than did corn fed with a similar ration, but, when fed with cottonseed cake, dried beet pulp, and alfalfa, produced the same gain as corn but required more feed to produce a unit of gain. A mixture of barley and wheat fed with cottonseed cake and alfalfa produced faster but less economical gains than the corn and wheat mixture.

Adding dried beet pulp to a ration of corn, cottonseed cake, and alfalfa increased the rate of gain 20 percent and also increased the efficiency of the ration. Dried pulp was but little more valuable than wet pulp when fed with cottonseed cake and alfalfa. Adding wet pulp to a ration of barley, cottonseed cake, and alfalfa increased the rate of gain 20 percent, while dried pulp when added to this ration increased it only 3 percent.

Corn silage did not produce as rapid gains as wet pulp when fed with alfalfa, and neither corn silage nor corn fodder with alfalfa was satisfactory for fattening lambs. Both corn silage and wet pulp improved the palatability and increased the rate of gain when added to a ration of barley and alfalfa. Beet top silage was not so efficient as either corn silage or wet pulp when fed with barley and alfalfa.

Cull beans alone were not so efficient as either equal parts of barley and cull beans or a grain mixture containing 25 percent of cull beans for feeding with alfalfa. Adding sugar beet molasses to either corn or barley and alfalfa improved the palatability and increased the rate of gain. Bean straw and wet pulp produced less rapid and less economical gains than alfalfa and wet pulp. Withholding water from lambs on a ration of wet pulp and alfalfa increased the feed consumption slightly and also the rate of gain as compared with this ration when supplemented with water. Cut alfalfa produced faster gains when fed with wet pulp than did long alfalfa.

[Experiments with sheep in Nevada] (*Nevada Sta. Rpt. 1932, pp. 8, 9*).—Preliminary results of tests to improve wool quality based on selection for quantity and character of fiber are discussed. Some results are also reported on pasture tests with sheep.

Swine performance record—litter comparisons, III, C. C. CULBERTSON, H. H. KILDEE, M. D. HELSER, and W. E. HAMMOND (*Iowa Sta. Leaflet 30 (1933), pp. 8*).—Continuing this study in cooperation with the U.S.D.A. Bureau of Animal Industry (E.S.R., 66, p. 859), data are reported on 17 litters fed during the summer of 1932.

The range in average daily gain per pig was from 1.1 to 1.6 lb., with an average for all litters of 1.3 lb. The feed required to produce 100 lb. of gain varied from 344 to 413 lb., with an average of 376 lb. The average value of all carcass cuts per 100 lb. of live weight ranged from \$8.65 to \$9.31, with an average of \$9.01. The average carcass score of all litters was 86.5, with a range of from 80 to 94 points.

The blood picture of pigs kept under conditions favorable to the production and to the prevention of so-called "anemia of suckling pigs", H. C. H. KERNKAMP (*Minnesota Sta. Tech. Bul. 86 (1932), pp. 32, figs. 4*).—The object of this experiment was to study the factors and conditions under which the symptoms of anemia develop, to collect hematological data on newborn pigs and those in the nursing and early stages of growth, and to determine means of preventing and overcoming the development of the disease. The sows used in the study farrowed their pigs indoors and raised them indoors to about 3 months of age. The pigs were all fed and handled in the same manner, except that some of the sows and litters were kept on concrete floors while others were kept in pens with loam soil floors. The blood of all pigs was examined at regular intervals throughout the experiment.

By excluding baby pigs from all access to soil for at least 5 or 6 weeks beginning at birth, anemia was experimentally produced, while allowing pigs access to soil prevented anemia.

Over 1,100 examinations of the blood of pigs included in this study are reported. While a specific normal range or mean could not be defined on these results, the following ranges are proposed: Birth, 5,500,000 to 7,000,000 erythrocytes, 9,000 to 16,000 leucocytes per cubic millimeter, and 9 to 13 g of hemoglobin per 100 cc of blood; 1 week, 3,000,000 to 4,500,000 erythrocytes, 9,000 to 16,000 leucocytes, and 6 to 9 g of hemoglobin; 2 weeks, where pigs have access to soil or its equivalent from birth, 5,000,000 to 6,500,000 erythrocytes, 9,000 to 16,000 leucocytes, and 7 to 10 g of hemoglobin; 2 weeks, where pigs

do not have access to soil or its equivalent from birth, 2,500,000 to 4,000,000 erythrocytes, 9,000 to 12,000 leucocytes, and 3.5 to 6 g of hemoglobin; 7 to 12 weeks, access to soil or its equivalent, 6,000,000 to 7,000,000 erythrocytes, 14,000 to 20,000 leucocytes, and 9 to 12 g of hemoglobin; and 7 to 9 weeks, no access to soil or its equivalent, 5,000,000 to 6,000,000 erythrocytes, 11,000 to 18,000 leucocytes, and 5.5 to 8 g of hemoglobin.

A marked decrease in the hemoglobin, accompanied by less marked decreases in the erythrocytes, and least marked in the leucocytes, occurred during the first week or 10 days of life of the pig, followed by a corresponding increase in the pigs living under the more natural environment. This change appeared to be physiological. These results show the necessity of making clear the condition or environment of pigs in reporting blood pictures.

At birth polymorphonuclear leucocytes were found in far greater numbers than the lymphocytes, but after 12 days the lymphocytes represented 69 percent of the leucocytes and the polymorphonuclears 28 percent. The relationship was maintained thereafter. Sex apparently played no part in the number of erythrocytes and leucocytes or in the amount of hemoglobin in the blood of young pigs.

Shrinkage of hogs from farm to market by truck and by rail, R. C. ASHBY (*Illinois Sta. Bul.* 388 (1933), pp. 557-576, figs. 2).—Continuing this study (E.S.R., 66, p. 258), the comparisons used were based on 2,084 hogs in 59 consignments, shipped an average of 129 miles by rail, and on 1,252 hogs in 76 consignments, shipped an average of 27 miles by truck.

Of all the consignments fed and watered at market, truck hogs showed less shrinkage than rail hogs whether full-fed at the farm or not. However, hogs trucked more than 55 miles had a larger shrinkage than rail hogs. Truck hogs not fed at the market showed heavier shrinkage than truck hogs fed at market. In both truck and rail consignments some hogs receiving less than a full feed at the farm appeared to shrink less than those full-fed. This was due to the fact that part of the shrinkage occurred before farm weights were taken.

Hogs full-fed at the farm, trucked a short distance but not fed or watered at market, shrank considerably less than rail hogs fed in the same way at the farm, shipped about six times as far, and fed and watered at market. When truck hogs were given less than a full feed at the farm and not fed or watered at market, they showed a heavier shrinkage than rail hogs treated in the same way at the farm but fed and watered at market. Comparable truck and rail consignments from the same farm, but shipped to different markets, showed slight but not significant differences in shrinkage in favor of the rail hogs. Comparable consignments shipped from the University of Illinois to Indianapolis, a distance of 130 miles, showed no significant differences in shrinkage.

The results tend to indicate that on hauls of comparable distances larger shrinkages may be expected on truck hogs than on rail hogs.

Grazing crops for poultry, R. S. DEARSTYNE and P. H. KIME (*North Carolina Sta. Bul.* 282 (1933), pp. 12, figs. 7).—The introduction to this bulletin discusses the vitamin requirements of poultry and the nutrient factors in green feeds.

On the basis of results obtained in experimental work, recommendations are made concerning the essentials of a desirable grazing crop, crops for fall, winter, spring, and summer grazing, and mixed sods of ryegrass and crimson clover.

Growth and development with special reference to domestic animals.—XXV, The course of energy and nitrogen metabolism in the domestic fowl during 48-day fasts, with special reference to temperament and

training of the birds; notes on 60-day fasts in swine, V. W. PHILLIPS, U. S. ASHWORTH, and S. BRODY (*Missouri Sta. Res. Bul. 179 (1932), pp. 30, figs. 12*).—Continuing this series of studies (E.S.R., 68, p. 508), two yearling White Rock hens were fasted, with sand and water available, until death, and a White Leghorn hen was given 50 g per day of a nitrogen-free diet until death. Their energy metabolism (basal metabolism) was measured by a volumetric and also by Haldane's gravimetric method daily. Their combined urinary and fecal nitrogen and also total creatinine were measured daily.

Mathematical analyses were presented of the time relations of the metabolic and body weight changes. The birds survived for 48, 40, and 23 days and declined in weight from 1,840, 1,974, and 1,982 g to 690, 776, and 1,341 g, respectively. A minimum energy metabolism of about 400 Calories per square meter or about 35 Calories per kilogram was found on the twentieth day of fast in the domestic fowl. The minimum nitrogen excretion was about 165 mg of total nitrogen per day on the twelfth day of fast and about 12 mg of total creatinine per kilogram per day at the same time. The basal metabolism data obtained by the volumetric and gravimetric methods appeared to agree within the limits of experimental error inherent in the subjects. The results obtained with a bird habituated to laboratory life gave the most consistent results, and this bird also survived longest.

Similar analyses of published fasting data of humans and dogs are presented, and the results are compared with those obtained with poultry. Some striking differences were noted. Data are also presented by S. R. Johnson on the energy and nitrogen metabolism of two sows during fasts of about 2 months' duration.

The quantities of vitamin A required by pullets for maintenance and for egg production, R. M. SHERWOOD and G. S. FRAPS (*Texas Sta. Bul. 468 (1932), pp. 19, figs. 4*).—White Leghorn pullets that had been raised on a standard ration, including free access to green feed, were divided into three lots of 35 birds each and were fed from October 15 to April 30. The birds were confined in pens having cement floors. Lot 1 received a mash containing 20 percent of yellow corn and scratch grain consisting of yellow corn. This group was calculated to receive an average of 270 units of vitamin A. Lot 2 was fed mash containing 10 percent each of yellow and white corn and scratch grain made up of equal parts of yellow and white corn. This group received an average of 120 units of vitamin A. The third lot received white corn only.

The birds in lot 1 were heaviest in weight and had laid the most eggs at the end of the experiment. In lot 2 the birds averaged slightly less in weight than those in lot 1 and had laid about 17 percent fewer eggs. The average weight of the birds in lot 3 was decidedly smaller than in the other groups, and they had laid appreciably fewer eggs. The birds in this last group lived from 34 to over 199 days and showed wide variations in the amount of vitamin A stored in their bodies. In all groups the vitamin A content of the eggs decreased from about 20 units per gram of yolk at the beginning to from 5 to 8 units at the end of the experiment.

From the data it was calculated that for only one unit of vitamin A in the egg, it required 6.3 units in the feed in addition to the maintenance requirements. For a pullet weighing 3.2 lb. the maintenance requirement was estimated at 105 units per day. Mash containing 8 percent of alfalfa meal furnished only 30 to 40 units of vitamin A per day. Heat-dried alfalfa containing 100 units per gram fed with yellow corn did not supply sufficient vitamin A to maintain high production and high vitamin A potency of the eggs, and

laying pullets apparently required green feed to provide sufficient vitamin A to maintain this standard.

Production and hatchability of eggs as affected by different kinds and quantities of proteins in the diet of laying hens, T. C. BYERLY, H. W. TITUS, and N. R. ELLIS (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 1, pp. 1-22, figs. 4).—Single Comb Rhode Island Red pullets were divided into two series of pens, nine pens in each series, in a study by the U.S.D.A. Bureau of Animal Industry. In the first series each pen contained 25 pullets, while in the second series there were 15 pullets per pen. Cockerels were transferred from one pen to the next every day. The pullets were confined and all received the same basal diet. The following proteins were fed to comprise from 11.2 to 23.6 percent of the diet: Desiccated meat meal, crab scrap meal, North Atlantic fish meal, dried buttermilk, dried yeast preparation, soybean meal, cottonseed meal, and a combination of meat meal, fish meal, and buttermilk.

The feed consumption in the check lot was practically the same as in the supplemented lots, but the egg production was low and the hatchability only fair. All of the supplements, except cottonseed meal and yeast preparation, gave good egg production, and the buttermilk supplement proved to be excellent for winter egg production. Cottonseed meal delayed the beginning of egg production, increased the incidence of chondrodystrophy in the eggs of certain hens, and gave low hatchability. The egg production on the yeast diet was not so good as that on the basal diet. In the lots receiving North Atlantic fish meal and soybean meal hatchability was low, and in the case of the latter supplement the incidence of chondrodystrophy in the eggs of certain hens was augmented.

Increasing the percentage of protein in the diet within the limits defined in this study, increased egg production by increasing the intensity, by increasing egg weight through direct effect on yolk weight, and by increasing body and yolk weight increased the albumen weight. The increased protein level had a favorable effect on the quantity of egg produced per unit weight of feed eaten but decreased the efficiency of proteins for egg production. In general, more eggs were hatchable from hens which laid intensely than from those which did not.

Proteins of vegetable sources increased the incidence of chondrodystrophy only in the embryos of hens likely to produce such embryos. The embryos of eggs from hens on diets containing vegetable proteins had a high second-week mortality.

Hereditary and environmental factors affecting variability in egg production, F. A. HAYS (*Massachusetts Sta. Bul.* 289 (1932), pp. 12, figs. 4).—This study was undertaken to determine variability of inherited characters affecting fecundity and also the effect of some environmental influences upon variability in egg production. Three lines of breeding were established by selecting for (1) uniformity in inherited characters affecting fecundity, (2) uniformity of annual egg records, and (3) high annual records. Each of these lines was carried through four generations.

The age at sexual maturity showed a coefficient of variation of about 10 percent brought about by environment in birds of the same genetic constitution for sexual maturity. Winter intensity was highly variable, due to genetic differences, but this variation was reduced by selection through the four generations. There were no indications that environment influenced clutch size. The length of winter pause could be reduced by constant selection, but it was also affected by environmental influences. There was evidence that broodiness as measured by total days broody was influenced by hereditary

modifiers. Persistency showed a variation of about 10 percent that was ascribed to environmental factors.

Variability in winter egg production decreased in the third line of breeding only, and increased inbreeding in successive generations did not reduce variations in winter egg records. Variations in annual egg production were less in the second and third lines of breeding than in the first. About 7 percent of the variation in annual production was due to differences in hatching dates. Annual egg records were not affected by increases or decreases in body weight of pullets during the laying year. Egg production was reduced by house temperatures near the freezing point or by temperatures above 70° to 75° F., and changes in production usually followed soon after temperature changes.

Costs of producing broilers and pullets in 1932, K. T. WRIGHT (*Michigan Sta. Quart. Bul.*, 15 (1933), No. 3, pp. 153-156, fig. 1).—An analysis of 48 detailed records of baby chicks showed that at 12 weeks of age the average cost was 27 c. per bird. About one third of the cost was the initial price of the chick, one third went for feed, and one third for labor, equipment, and other costs. The average weight at 12 weeks was 1.8 lb. per bird, which made the cost of raising 15.3 c. per pound. The 10 lowest records had an average production cost of 11 c. per pound, while the 10 highest records averaged 23 c. per pound. The low-cost group had an average mortality of 11 percent in 12 weeks, while the other group had 20 percent. The former group ate 3.2 lb. of feed to produce 1 lb. of poultry, while the latter group consumed 4.9 lb. of feed.

In analyzing 51 records for 24 weeks, it was found that out of every 100 chicks started 44 broilers were sold or used and 40 pullets were saved. These pullets weighed 3.4 lb. each at 24 weeks. The average cost of the pullets was 53 c., of which 43 percent went for feed, 23 percent for baby chicks, 14 percent for labor, and 20 percent for other costs. It required over 18 lb. of feed to grow each pullet. One third of the group had a mortality of less than 10 percent and the average cost of their pullets was 48 c., while another one third lost over 20 percent of their chicks and their pullets cost 57 c. each. The most efficient producers used 3.5 lb. of feed per pound of poultry produced, while the least efficient group used 7.1 lb. of feed.

Raising chicks in 1933, D. C. KENNARD (*Ohio Sta. Bimo. Bul.*, 18 (1933), No. 2, pp. 42-47, figs. 2).—Practical recommendations and information on raising chicks are presented to assist those inexperienced in poultry production to avoid some of the frequent causes of failure and possibly to serve the more experienced producer.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products in California] (*California Sta. Rpt.* 1932, pp. 9-13).—Studies with dairy cattle have yielded information on the sanitary care, operation, and installation of milking machines; "cardboard" flavor in milk; feed flavors in milk; effect of temperature and humidity on milk production; effect of fly sprays on cows; the feasibility of raising dairy calves without roughage; and the lower total digestible nutrients from a given area of land when utilized for Sudan grass than as alfalfa pasture.

In dairying data are reported on the effect of variations in speed of cream separators upon fat test of cream, effect of different methods of cooling pasteurized cream upon its consistency and whipping quality, the cause of and remedy for sticky, crumbly butter resulting from winter feeding, a com-

parison of the efficiency and capacity of different types of milk pumps, the value of internal-tube milk coolers, effect of fast freezing on the texture of ice cream, effect of stabilizers on the body of sherbets and ices, the use of honey in ice cream, and the effect of the type of milk curd in infant feeding.

[**Studies with dairy cattle in Delaware**] (*Delaware Sta. Bul. 179 (1932)*, pp. 21, 23).—These studies have produced information regarding the relation of the alcohol-milk test to pregnancy in cattle, by C. C. Palmer, and powdered skim milk for dairy calves and dried tomato pomace in the dairy ration, both by A. E. Tomhave.

[**Investigations with dairy cattle and dairy products in Indiana**] (*Indiana Sta. Rpt. 1932*, pp. 29–33, 52, 53, figs. 2).—Studies with dairy cattle yielded information on supplementing soybean hay with and without high protein concentrates, suitability of different varieties of soybeans for hay, chemical and physical effects of soybean feeding on the commercial value of milk and butterfat, the value of grinding grains for growing dairy heifers, the vitamin A content of butterfat from the Guernsey and Ayrshire breeds and from cows under different conditions of feeding, vitamin A value of alfalfa hay cut at different stages of maturity, and soybean hay as a good source of vitamin A.

Dairy products studies included investigations of factors affecting body, texture, and quality of ice cream; enzymes in sweet and sour farm-skimmed cream as related to the keeping qualities of butter; methods used in washing milking machines and their comparative value; chemical and physical effects of heavy soybean feeding on milk and butterfat production; the effect of hydrogen-ion concentration and season of the year upon the keeping qualities of butter; marketing of cream and milk; measuring the vitamin A value of butter by its natural color; and maintaining the vitamin A value of butter by proper feeding.

[**Investigations with dairy cattle and dairy products in Iowa**] (*Iowa Sta. Rpt. 1932*, pp. 18, 25, 26, 49–54).—Dairy cattle studies report data on the consequences of inbreeding in Holstein-Friesian cattle, by J. L. Lush and C. Y. Cannon; the comparative efficiencies of a modified silage cutter and a hay fork for storing hay, by Cannon, E. N. Hansen, and E. V. Collins; and a study of fly sprays, by Cannon and C. H. Richardson.

With dairy products, studies have been conducted on the influence of the physical properties of milk on its rate of digestion in vivo, by Cannon and D. L. Espe; the influence of the acidity in cream on fat losses in buttermilk, and the effect of lipins and of sulfonation of unsaturated fats on certain modified Babcock tests of fat in buttermilk, both by E. W. Bird; standardization of Iowa butter, by M. Mortensen; the significance of numbers and types of bacteria in butter from the standpoint of its keeping quality, development of a method for the direct microscopic examination of butter, the bacterial efficiencies secured in pasteurizing milk from individual farms, an organism causing rancidity in butter, micro-organisms causing surface taint in butter, an unusual type of coagulation in evaporated milk, *Bacillus coagulans* as the cause of coagulation in evaporated milk, the germicidal property of milk, pasteurization efficiency and subsequent contamination in Iowa market milk plants, classification of the organisms important in dairy products, development of butter cultures from mixtures of organisms, the products formed by *Streptococcus citrovorus* and *S. paracitrovorus* from citric acid and from lactic acid, methods of preparing butter cultures for mail shipment, types and sources of "pin point" bacteria in ice cream, bacterial standard for Iowa ice cream, and churn sanitation, all by B. W. Hammer.

[Experiments with dairy cattle at the New York Cornell Station] (*New York Cornell Sta. Rpt. 1932, pp. 99, 100, 101, 103*).—In studies with dairy cows data are reported on the minimum amount of protein for dairy cows, by E. S. Savage, E. S. Harrison, and S. H. Work; raising dairy calves on dry concentrate mixtures, by Savage, Harrison, and C. H. Crawford; and fatty compounds in the blood of lactating and of dry cows, by L. A. Maynard, C. M. McCay, P. J. Schaible, K. L. Turk, and Work.

[Investigations with dairy cattle and with milk in Ohio] (*Ohio Sta. Bul. 516 (1933), pp. 68-76*).—Results of experiments with dairy cattle are reported on feeding wheat to dairy cows, by C. F. Monroe, C. C. Hayden, and C. E. Knoop; the relative feeding value of ground soybeans and soybean oil meal, by A. E. Perkins, M. A. Bachtell, and W. E. Weaver; dairy feeds which tend to cause acidosis, by Perkins and Monroe; value of Manamar for growth and milk production, by Monroe and W. E. Krauss; soluble blood flour v. skim milk powder for calves and the vitamin A content of corpora lutea from cows, by Krauss, Monroe, and Hayden.

The milk studies include results on the composition of milk as affected by the amount of protein fed, by Perkins; raw v. pasteurized milk, by Krauss and R. G. Washburn; the value of copper and iron supplements in an exclusive milk diet for dairy calves, by Knoop and Krauss; the effect of the addition of small quantities of iodine to milk on the rate of bacterial growth, by T. S. Sutton, Krauss, and Bohn; the effect of avitaminosis A on the nervous system of the white rat, by Sutton, H. E. Setterfield, and Krauss; increasing the vitamin D content of the milk, by Krauss and R. M. Bethke; and the effect of feeding yeast to cows on the vitamin B and vitamin G content of milk, by Krauss and C. H. Hunt.

Two systems of feeding dairy cows: High roughage and low grain versus low roughage and high grain, J. B. LINDSEY and J. G. ARCHIBALD (*Massachusetts Sta. Bul. 291 (1932), pp. 15*).—Continuing this study (E.S.R., 65, p. 370), over a period of 3.5 years, the high roughage group was fed approximately 1 lb. of grain for each 4.5 lb. of milk produced, 35 lb. of silage, and as much hay as they would clean up. The low roughage group received approximately 1 lb. of grain for each 2.5 lb. of milk, 20 lb. of silage, and hay as above mentioned.

The cows in lot 2 maintained their general appearance somewhat better and made slightly larger gains in weight than those in lot 1. In the latter group the cows tended to be thinner and more rough-coated. Lot 2 produced more milk on a daily and yearly basis and, while their lactation periods were shorter, their dry periods were also shorter than those in lot 1. In lot 2 the cows required 7 percent less dry matter and 2.7 percent less digestible nutrients to produce 100 lb. of milk. The feed cost of milk production was practically the same for both groups, but the high roughage method of feeding involved a smaller cash outlay. The cows in the low roughage group maintained their milk production from year to year better than those in the high roughage group. In lot 1 the cows showed a decline in milk test as compared with the tests previous to the start of the experiment. Group 2 was nearer normal in reproductive function than group 1.

Pasturing Sudan grass at Wooster, C. F. MONROE and C. C. HAYDEN (*Ohio Sta. Bimo. Bul., 18 (1933), No. 2, pp. 34-36, fig. 1*).—The results of a test with Sudan grass pasture for three liberally milking cows, when calculated to an acre basis, showed a total production for 129 days of 11,154 lb. of milk and 362 lb. of butterfat. Also 1 acre of Sudan grass would furnish 215 cow-pasture days. Chemical analyses of the grass cut at three different dates showed

that the protein content on an air-dry basis varied from 18.2 to 23.4 percent. The precautions that must be taken in using Sudan grass for pasture are pointed out.

Sorghum silage as a source of vitamin A for dairy cows, O. C. COPELAND and G. S. FRAPS (*Texas Sta. Bul. 473* (1932), pp. 12, fig. 1).—A group of five Jersey cows was fed in dry lot on a ration of cottonseed meal, sorghum silage, and cottonseed hulls ad libitum. To the cottonseed meal was added 2.5 percent of limestone and 1 percent of salt, and the mixture was fed at the rate of 1 lb. for each 2.25 lb. of milk produced daily. The silage contained about 5 units of vitamin A per gram and was the principal source of this vitamin in the ration, another group was fed cottonseed meal and hulls only, while a third group had access to pasture in addition to meal, hulls, and silage.

In the first group the butterfat contained from 2 to 12 units of vitamin A per gram, the fat of the second group averaged 2.5 units, while that from cows in the third group contained as much as 33 units. The cows in group 1 produced fat containing an average of 1,960 units; those in group 2 averaged 340 units; and those in group 3 averaged 17,280 units per day. These results showed that unless supplemented with pasture the ration did not supply sufficient vitamin A to produce butterfat of high potency in vitamin A.

After prolonged feeding on cottonseed meal and hulls the cows became very weak. Two of them were cured by administering cod-liver oil, and one by feeding fresh green grass. It was evident that the animals were suffering from a deficiency of vitamin A, which the ration did not supply. The cows in the first group showed symptoms of night blindness and other disorders, indicating that the ration lacked sufficient vitamin A for good health. It was estimated that cows on sorghum silage consumed about 106,000 units of vitamin A daily and returned only about 1,960 units per day in the butterfat, which was low in this vitamin. These results indicate that the dairy cow has a high daily requirement for vitamin A, either because of the destruction of the vitamin during the digestion process or because of the high maintenance requirement during lactation, or both.

The effect of milk foam on dairy calves, T. M. OLSON (*South Dakota Sta. Bul. 273* (1932), pp. 8).—To determine the effect of milk foam on the growth of calves, two lots of three calves each were fed the same basal ration. In addition one lot received a definite amount of skim milk direct from the separator, while the other lot received an equal weight of skim milk and foam. The amount of foam consumed by the latter lot was approximately twice what would normally collect on the quantity of milk received. The calves were weighed at 10-day intervals and were measured for height at withers at 30-day intervals. Two trials were conducted with calves that were rather old when started on the experiment, while a third test was conducted with calves 3 weeks old.

There was no significant difference in the increase in weight or height at withers of calves fed skim milk and of those fed skim milk and foam. The calves receiving foam tended to bloat slightly at times, but no bad after effects were noted. The hair of calves receiving foam was sometimes rough, indicating a lowered physical condition. The results as a whole indicated that feeding the foam that normally collects on skim milk is a safe practice when the amount fed is given in definite quantities, and that any digestive troubles that occur are due to improper feeding and not to the foam itself.

Normal growth in dairy cattle, D. L. ESPE, C. Y. CANNON, and E. N. HANSEN (*Iowa Sta. Res. Bul. 154* (1932), pp. 297-319, figs. 4).—This study was based on growth in live weight and in skeletal development of dairy cattle in the

station herd in order to contribute to the present information on normal growth in dairy cattle.

The male calves of the breeds studied weighed more at birth than the female calves. The average birth weights of female calves were for Holsteins 89 lb., Guernseys 65, Ayrshires 63, and Jerseys 50 lb., and for males 99, 69, 71, and 54 lb. The coefficients of variation in live weight among individuals ranged from 15 percent in calves to less than 10 percent in 2-year-olds. The time of first freshening marked the greatest change in the rate of growth in live weight. The animals of the different breeds approached mature size at about the same relative rate. Mature growth values were approached most rapidly in height at withers. Holsteins, Ayrshires, and Jerseys were wider in relation to depth than Guernseys. The average mature weight in this herd was Holsteins 1,405 lb., Ayrshires 1,111, Guernseys 1,072, and Jerseys 950 lb. Gestation and lactation had considerable influence on live weight. Late-freshening heifers weighed more than heifers calving at the usual time, but after freshening the weights in both groups were quite comparable.

Selecting sires by progeny to maintain butterfat level, A. C. BALTZER (*Michigan Sta. Quart. Bul.*, 15 (1933), No. 3, pp. 143-146, fig. 1).—An analysis of the level of production of the dams and their daughters by 204 bulls of the Holstein, Jersey, and Guernsey breeds showed that the progeny of a sire was a better basis for selection than type or ancestry performance records. It was also revealed that the ability to transmit higher butterfat production appeared to exert itself somewhat stronger within the Jersey breed than within other breeds. The inheritance factor varied more within the individuals of a breed than between the best transmitting bulls of the different breeds.

The chemical composition and nutritive properties of milk as affected by the level of protein feeding, I, II (*Ohio Sta. Bul.* 515 (1932), pp. 69, figs. 4).—The results of the experiments here published are divided into two parts.

I. *Chemical composition*, A. E. Perkins (pp. 3-44).—In conjunction with studies previously noted (E.S.R., 51, p. 875), analyses were made of several hundred samples of milk according to the protein content of the ration fed the cows. The analyses showed that even at the greatest practical extremes in the level of protein feeding the only variation which was consistent and progressive from group to group was the percentage of residual or nonprotein nitrogen, which increased in amount as the level of protein feeding increased. The urea portion of the nonprotein nitrogen increased eight times from the lowest to the highest level of protein feeding. Amino nitrogen and creatine-creatinine nitrogen were also apparently affected to a lesser extent. On a dry matter basis the proportion of protein in the dry matter increased sufficiently to account for the observed increase in nonprotein nitrogen.

The increase in nonprotein nitrogen appeared to be coupled with a slight increase in the proportion of albumin at the highest level of protein feeding. Together these resulted in lowering by about 6 percent the proportion of total nitrogen which appeared in the form of casein.

A careful analysis of the data did not confirm a tentative conclusion previously made that the low protein ration had a slightly depressing effect on the fat content of the milk. The character of the fat was apparently unaffected by the level of protein feeding. The results seem to justify the conclusion that no changes of major importance may be expected in the composition of milk from relatively small variations in the level of protein feeding.

II. *Nutritive properties*, W. E. Krauss and C. C. Hayden (pp. 45-69).—The food values of milk produced by some cows described in part 1 on rations

of extremely high protein, extremely low protein, or normal protein contents were compared. Determinations for vitamins A, B (complex), and D, total nutritive value, and biological value of the proteins were made with rats, and a practical feeding trial with heifer calves was also conducted.

While slight differences were found in the vitamin A and D contents of the three kinds of milk, the differences could be traced to variations in these vitamins in the rations fed. Enough difference was found in the vitamin B (complex) content to indicate that some relationship existed between the level of protein feeding and the amount of vitamin B (complex) in the milk. A ration deficient in the vitamin B (complex) required 15 cc of "normal milk", 16 cc of "high protein milk", and 20 cc of "low protein milk" to allow normal growth. No difference was found in the total nutritive effect of the milks, based on the method of exclusive milk feeding, or in the biological value of the milk proteins, based on gain per gram of protein intake. With calves there was no significant difference in the rates of gain when any of the three milks were fed as part of the practical ration.

Studies on the nutritive value of milk.—II, The effect of pasteurization on some of the nutritive properties of milk, W. E. KRAUSS, J. H. ERB, and R. G. WASHBURN (*Ohio Sta. Bul. 518 (1933), pp. 33, figs. 8*).—Continuing this study (E.S.R., 65, p. 892), milk from cows receiving a ration of alfalfa hay, corn silage or soaked beet pulp, and a grain mixture of corn, oats, bran, and linseed meal was sampled twice weekly and divided into two parts. One sample was held in a cooler at from 40° to 45° F., while the other sample was "laboratory pasteurized" in a closed glass container at 145° F (62.7° C.) for 30 minutes. Other samples of milk were pasteurized in the usual commercial manner. A total of 32 pairs of albino rats were fed so that one of each pair received raw milk exclusively and the other pasteurized milk exclusively.

The rats developed nutritional anemia at about the same rate upon the basis of hemoglobin determinations and red cell counts on either raw or pasteurized milk. Copper and iron determinations showed no loss of these elements when milk was heated to 145° F. in a closed vessel for 30 minutes or when it was pasteurized under commercial conditions. When the anemia factor was eliminated by adding copper and iron to the milk fed, there was no significant difference in the total growth of rats fed raw or pasteurized milk exclusively over a 12-week period. No difference was found in the ash of the femurs and entire bodies or in the calcium and phosphorus content of the entire bodies of rats fed exclusively on one or the other of these milks. Heating milk in the closed glass container did not affect vitamins A, G, and D, but did destroy at least 25 percent of the vitamin B in the original raw milk. Using the Hill technic (E.S.R., 51, p. 379), 24 samples of the milk were tested for hardness of curd, and the results indicated that curd tension was slightly reduced by pasteurization. It is concluded that the nutritive deficiencies of pasteurized milk may readily be overcome by proper dietary control so that its continued use offers no serious problem.

The application of a yeast extract medium to a test for determining quality of milk, E. D. DEVEREUX (*Amer. Jour. Pub. Health, 22 (1932), No. 12, pp. 1291-1293; abs. in Michigan Sta. Quart. Bul., 15 (1933), No. 3, p. 208*).—At the Michigan Experiment Station an attempt was made to shorten the incubation period or improve the efficiency of the Cooledge test (E.S.R., 46, p. 479). By changing the formula of the medium used the correlation coefficient between the test and the actual keeping quality of the milk was increased from +0.75 or +0.77 to $+0.86 \pm 0.02$. This was also an increase in the accuracy over the methylene blue reduction test. The new medium permitted

earlier detection of milk of pure quality and did not require the attention of the operator in most cases for 6 hours after the tubes were inoculated. Because of its high degree of accuracy and applicability the test may be used to determine the quality of other dairy products.

A yeast extract medium for the examination of milk, E. D. DEVEREUX (*Amer. Jour. Pub. Health*, 22 (1932), No. 12, pp. 1293, 1294; *abs. in Michigan Sta. Quart. Bul.*, 15 (1933), No. 3, p. 206).—The yeast extract broth used in the above study had the following formula: Yeast extract (Difco), 5 g; peptonized milk (Difco), 10 g; salt, 5 g; dextrose, 10 g; and water, 1,000 cc. This broth was adjusted to pH 7, autoclaved for 15 minutes at 15 lb. pressure, and 15 g of washed agar was added to each liter of broth.

The relationship of acetylmethylcarbinol and diacetyl to butter cultures, M. B. MICHAELIAN, R. S. FARMER, and B. W. HAMMER (*Iowa Sta. Res. Bul.* 155 (1933), pp. 321-360).—The results obtained in these studies are reported under the following headings: (1) Acetylmethylcarbinol and diacetyl in butter cultures, (2) sources of acetylmethylcarbinol and diacetyl in butter cultures, (3) destruction of acetylmethylcarbinol and diacetyl by the butter culture organisms, and (4) development of a special butter culture.

It was found that butter cultures having a satisfactory flavor and aroma contained considerable amounts of these compounds, but cultures lacking in these qualities contained little or none. From a quantitative standpoint the carbinol was more important than the diacetyl. A culture containing only a small amount of these compounds showed few of the citric acid fermenting streptococci normally present in considerable numbers. In the early stages of ripening of satisfactory cultures only small amounts of compounds were present, but in later stages there was a material increase in the compounds, generally accompanied by a pronounced increase in volatile acid. Holding cultures for long periods at 21° C. sometimes caused a definite decrease in the compounds, but a decrease in the volatile acids did not occur.

Comparatively few of the *Streptococcus lactis* strains and only a small number of the citric acid fermenting streptococci produced these compounds in milk. With *S. lactis* more of the compounds were produced when milk was modified by adding 0.1 or 0.3 percent of acetic acid or 0.03 percent of acetaldehyde than when it was not modified. With the citric acid fermenters the amount of the compounds produced was small, but the addition of citric acid in certain concentrations, either alone or in combination with another acid, commonly increased the production of these compounds. Adding lactic or sulfuric acid to milk did not influence the production of these compounds or of volatile acids, but the addition of citric acid increased both.

The compounds were destroyed by citric acid fermenters in a pasteurized mixture of milk and butter culture and also in milk that was pasteurized after ripening to various acidities, and the destruction was conspicuous at comparatively low acidities. When the culture was neutralized and held at a temperature favorable for the growth of the organisms contained, there was a pronounced decrease in the compounds, and in cultures where the compounds had decreased they were greatly increased by the addition of citric acid. Repeated neutralization of a culture resulted in a complete disappearance of the compounds.

In a special butter culture the production of the compounds was very rapid, and at the end of a holding period of from 15 to 24 hours at 21° C. the amounts present were usually larger than the amounts present in regular cultures, and considerable volatile acid was produced. Additional holding usually resulted in a decrease in the compounds. During the period when the compounds were

being produced rapidly there was a decrease in the acidity of the culture. The production of the compounds was more rapid at from pH 4 to 4.3, although they were produced over a range of from pH 3.1 to 4.6 with the strain of citric acid fermenting streptococci used.

Eighteenth annual report of the creamery license division, T. H. BINNEY (*Indiana Sta. Circ. 194* (1932), pp. 16, fig. 1).—This is the usual report of the State creamery license division for the year ended March 31, 1932 (E.S.R., 66, p. 570). It deals with the comparative annual production of dairy products in Indiana, the creamery inspection, and the examination of testers.

VETERINARY MEDICINE

[Work in animal pathology in California] (*California Sta. Rpt. 1932*, pp. 16–18).—Brief references are made to the progress of work (E.S.R., 67, p. 595) with Bang's disease in cattle and swine, tuberculosis in cattle and the B.C.G. culture, anaplasmosis of cattle, brain disease of horses and mules (E.S.R., 66, p. 76), polyarthrititis infection in sheep, laryngotracheitis, pullorum disease, fowl pox vaccine, fowl cholera in turkeys, poisoning of young turkeys by ashes of eucalyptus wood, and inflammation of sinuses and respiratory disturbances of turkeys.

[Report of work with diseases of livestock in Indiana] (*Indiana Sta. Rpt. 1932*, pp. 60–62).—A brief account is given of the work of the year (E.S.R., 67, p. 596), including a study of immunity in heifers injected with living cultures of *Brucella abortus* during calthood; infectious abortion, enteritis, and colitis in pigs; the occurrence of *Salmonella suispestifer* in pigs; treatment of lambs for stomach worms; agglutination tests for Bang's disease in cattle, infectious abortion in hogs and mares, pullorum disease in poultry, and *Brucella* infection in goats; autopsies of poultry, hogs, sheep, etc.; a disease affecting the fore limbs of cattle; and leg weakness in chicks.

[Work with diseases of poultry, etc., in Iowa] (*Iowa Sta. Rpt. 1932*, pp. 30, 31, 90–92).—The work of the year briefly referred to (E.S.R., 67, p. 450) includes that with tracheitis in poultry, range paralysis in chickens, the influence of various nutritional factors on blindness and range paralysis in chickens, and the egg as a possible mode of transmission of range paralysis in chickens, all by C. Murray, F. D. Patterson, H. L. Wilcke, and E. W. Henderson; the influence of protein levels and calcium and phosphorus balance upon rachitis of chicks, by Henderson, Wilcke, and Murray; breeding for resistance to fowl typhoid in poultry, by W. V. Lambert and N. F. Waters; and genetic investigation of resistance and susceptibility to disease in laboratory animals, by Lambert.

[Report of work in animal pathology and parasitology in Ohio] (*Ohio Sta. Bul. 516* (1933), pp. 78, 79, 81, 83, 84, 88, 89).—Results of the work of the year (E.S.R., 67, p. 69) are briefly noted under the headings of *Brucella abortus* infection in cattle and the presence of *B. abortus* in the udder of cows and its relationship to agglutinins in the milk and blood, both by B. H. Edgington and A. Broerman; nodular formation by the larvae of *Oesophagostomum columbianum* and longevity of *O. columbianum* larvae, both by R. E. Rebrassier; swine erysipelas, by [A. F.] Schalk; January-hatched chicks less subject to coccidiosis and vices, by D. C. Kennard and V. D. Chamberlin; and immunization of chickens against fowl pox by the use of pigeon pox virus and fowl or range paralysis, both by Edgington and Broerman.

[The second report of the director of the Institute of Animal Pathology, University of Cambridge, 1931] (*Cambridge Univ., Inst. Anim. Path. Rpt.*

Dir., 2 (1931), pp. V+222, pls. 11, figs. 25).—The contributions here presented (E.S.R., 66, p. 866) are as follows: Immunisation of the Fowl and the Pigeon against Epithelioma Contagiosum, by R. E. Glover (pp. 1–20) (see p. 112); The Dublin Type of *Salmonella* as a Cause of Disease in Calves, by T. J. Bosworth and R. Lovell (pp. 21–27); The Use of B.C.G. in the Vaccination of Calves against Tuberculosis, by J. B. Buxton and A. S. Griffith (pp. 28–45); Further Results of Immunity Experiments on Calves with the B.C.G. Vaccine, by A. S. Griffith, J. B. Buxton, and R. E. Glover (pp. 46–52); Observations on the Classification of *Bacillus welchii*, by A. J. Wilsdon (pp. 53–85); Some Biochemical Studies on the Blood of Sheep (pp. 86–120) and The Effects of Feeding Mineral Supplements on the Chemical Content of the Blood of Sheep (pp. 121–133), both by G. D. Shearer and J. Stewart; The Effect on the Iodine Content of (1) the Thyroid Glands and (2) the Blood of Wethers and Ewes When Dosed with Potassium Iodide, by M. C. Franklin (pp. 134–142); Vitamin C Requirements of the Dog—Attempts to Produce Experimental Scurvy, by J. R. M. Innes (pp. 143–150); The Mode of Action of Vitamin D, by L. J. Harris and J. R. M. Innes (pp. 151–174) (E.S.R., 65, p. 896); A Preliminary Note on “Blood Tumours” (Haemangio-Endotheliomata) in the Fowl, by F. Blakemore and J. R. M. Innes (pp. 175–183); The Relationship of Glycerine in Veal Broth to the Potency of Tuberculin, by H. R. Allen (pp. 184–193); A Note on *Simulium* sp. Attacking Horses and Cattle in Herefordshire (pp. 194–197), Some Nematode Parasites of the British Fallow Deer (*Dama dama*) (pp. 198, 199), and A List of Parasites Examined during the Year (pp. 200–203), all by J. S. Steward; and Experiments on the Treatment of Parasitic Gastro-enteritis in Sheep and Lambs (pp. 204–212), Some Notes on the Treatment of Equine Strongylosis with Oil of Chenopodium (pp. 213–219), and A Note on the Size of the Eggs of Some Species of Sheep Worms (pp. 220–222), all by W. A. Wood.

Original contributions from the Mukden Institute for Infectious Diseases of Animals (*Mukden Inst. Infect. Diseases Anim., Orig. Contrib.*, 2 (1932), pp. [3]+2+268, pls. 14, figs. 17; *Eng. abs.*, pp. 231–268).—These contributions on animal pathology, in Japanese, with English abstracts, have all been previously noted from other sources except On the Duration of the Existence of Rinderpest Virus in the Body of Immunized Cattle after Inoculation with the Highly Virulent Virus, by T. Inoue and R. Shimizu (pp. 161–166, 255).

Report of the parasitologist, H. L. VAN VOLKENBERG (*Puerto Rico Sta. Rpt.* 1932, pp. 21–23).—In this report of the status of parasites in Puerto Rico (E.S.R., 67, p. 597), nodular worms and stomach worms of cattle and the tape-worm *Moniezia expansa* of cattle and goats are considered.

Microscopic diagnosis of parasitism in domestic animals (*Illinois Sta. Circ.* 401 (1933), pp. 67, figs. 89).—This is an illustrated account of the technic employed in the detection of parasites in domestic animals.

Tests of the efficacy of single treatments with tracheal brushes in the mechanical removal of lungworms from foxes, K. B. HANSON (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 1, pp. 12–31, figs. 7).—In critical tests made to determine the efficacy of two types of tracheal brushes in the treatment of foxes for lungworms of the species *Eucoleus aerophilus* Crep. and *Crenosoma vulpis* Crep., the homemade type rated slightly higher than the tracheal swab syringe, largely due to the fact that the swab syringe failed to reach to the bottom of the trachea in long rangy foxes. It is concluded that the tracheal brush treatment is relatively safe and harmless when performed with proper care and judgment. The average efficacies against tracheal infestation in the arbitrary groups, in percentages, were 70.48, 80, 82.86, 87.96, and 95.19, respectively, for

Eucoleus, and 100, 0, and 66.67, respectively, for *Crenosoma*. The average efficacies against the entire *Eucoleus* infestation in the arbitrary groups, in percentages, were 52.86, 60.18, 38.41, 53.67, and 29.57.

N-butylidene chloride, a new anthelmintic, W. H. WRIGHT, J. BOZICEVICH, P. C. UNDERWOOD, and J. M. SCHAFER (*Vet. Med.*, 28 (1933), No. 2, pp. 52-64).—In further experiments (E.S.R., 66, p. 177) n-butylidene chloride, when administered to dogs at a dose rate of 0.3 cc per kilogram of body weight, "showed an aggregate efficacy of 96.5 percent for the removal of ascarids, 100 percent for the removal of hookworms, and 7.8 percent for the removal of whipworms. n-butylidene chloride, administered to cats at a dose rate of 0.3 cc per kilogram of body weight, gave an aggregate efficacy of 90.4 percent for the removal of ascarids and 81.6 percent for the removal of hookworms. In 8 of 11 cats the drug removed all hookworms present. . . .

"Toxicity tests carried out on 2 horses indicate that n-butylidene chloride has a safety factor for the horse of at least 14 times the therapeutic dose rate of 0.2 cc per kilogram of body weight. This factor would probably be much higher where the drug is followed by an adequate dose of a suitable purgative, as is recommended for routine administration. n-butylidene chloride administered to 1 horse at a dose rate of 0.1 cc per kilogram of body weight was 100 percent effective for the removal of *Oesophagodontus robustus* and *Oxyuris equi* and showed a fair degree of efficiency against *Strongylus* spp. and cylicostomes, even though the animal in question did not receive an adequate dose of purgative. It seems probable that n-butylidene chloride could be recommended for administration at this dose rate provided the drug is followed by an adequate dose of raw linseed oil. However, additional tests are needed to establish this point.

"Clinical tests with n-butylidene chloride gave satisfactory results and stopped losses in a herd of calves dying of parasitism.

"n-butylidene chloride administered to adult chickens in doses of 1 to 6 cc gave an aggregate efficacy of 98.4 percent for the removal of *Ascaridia lineata*. The drug in doses of 2 cc or more removed all specimens of *Ascaridia* present in experimental birds. n-butylidene chloride was not generally effective for the removal of *Heterakis gallinae*, showing an aggregate efficacy of only 4.7 percent against this species of worm."

Some observations on chlorin as a disinfectant, W. L. CHANDLER (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 1, pp. 95-99).—In work conducted at the Michigan Experiment Station avian fecal matter containing oocysts was rendered bacteriologically sterile by suspending it for several hours in the ice box in a sodium hypochlorite solution containing 1 percent available chlorine.

The experimental work has shown "that when 0.1 cc of concentrated (centrifuged) finely divided fecal matter containing coccidial oocysts is shaken in a test tube with 10 cc of a hypochlorite solution containing, after acidification, not less than 0.1 percent available chlorine and hydrochloric acid in amount corresponding to in excess of N/10, coccidial oocysts are killed within 10 minutes. This same method apparently also kills all of the bacteria present in the fecal matter, as attempts to culture bacteria from the contents of test tubes after a 10-minute exposure consistently failed."

The author concludes that the action of strongly acidulated hypochlorites in killing coccidial oocysts and in sterilizing fecal matter is due to direct chlorination.

The relation of temperature to the germicidal efficiency of lye solutions, E. C. McCULLOCH (*Jour. Bact.*, 23 (1932), No. 1, pp. 50, 51).—This is a digest of work with lye as a disinfectant conducted at the Wisconsin Experiment

Station, as referred to in the station report previously noted (E.S.R., 67, p. 740). Dilute solutions of high-grade household lye were found very efficient in destroying *Brucella abortus*, *Escherichia coli*, and other related micro-organisms.

"In studies in barn disinfection, no nonsporulating organisms were recovered in subculture from floors or gutters after 5 minutes' exposure to a 1:150 lye solution. A decrease in temperature was found to exert relatively small influence upon the germicidal efficiency of lye solutions. Little consistent difference in the killing time was noted in trials made at 2° and 25° C. Electrometric pH determinations of the lye solutions at various temperatures indicate that the ratio of hydroxyl-ion to hydrogen-ion activity decreases with increase in temperature."

The rôle of disinfection in the control of Bang's disease, E. C. McCULLOCH (*Vet. Med.*, 27 (1932), No. 11, pp. 458-461).—Particular attention is called to the value of a lye solution as a disinfectant, as above noted. It was found that the 1:150 dilution of lye, made by adding one 13-oz. can of highest lye to 15 gal. of water, almost instantly destroyed *Brucella abortus* as well as all other Gram-negative, nonsporulating rods. Whitewash, if freshly made from quick lime, is a very efficient germicide against *B. abortus*, *Escherichia coli*, and related micro-organisms. The addition of cresol compounds to whitewash did not increase its germicidal efficiency.

Bovine anaplasmosis: A method of obtaining pure strains of *Anaplasma marginale* and *Anaplasma centrale* by transmission through antelopes, W. O. NEITZ and P. J. DU TOIT (*Union So. Africa Dept. Agr. Rpt. Dir. Vet. Serv. and Anim. Indus.*, 18 (1932), pt. 1, pp. 3-20, figs. 9).—In this contribution the authors consider the transmission of *Anaplasma* to blesbok, duiker, and sheep. "*A. marginale* could be demonstrated microscopically in the blood of the blesbok and the duiker. These animals do not manifest clinical symptoms as a result of the infection. *A. marginale* could not be seen microscopically in sheep, but was demonstrated by subinoculation into a susceptible calf. *A. centrale* could not be seen microscopically in the blesbok, but was demonstrated by subinoculation into susceptible cattle. *P[iroplasma] bigemini* and *Th[eileria] mutans* could not be transmitted to the blesbok and the former not to the duiker. *A. marginale* and *A. centrale* were obtained in a pure state by passage through these antelopes. The morphology as well as the virulence of these parasites are not changed by passage.

"Experiments should be carried out to determine whether any other families besides the Bovidae, e. g., Cervidae and Camelidae, belonging to the group Pecora are also susceptible to anaplasmosis. There is good reason to believe that anaplasmosis can be transmitted to buck by ticks. This fact will have to be taken into consideration when measures are taken to control this disease. Furthermore, this may explain why anaplasmosis occurs on farms where it is known to be absent for years. The evidence available seems to indicate that anaplasmosis was primarily a disease of antelopes, and that bovines were infected when brought into areas where the disease occurred."

A discussion of some fundamental principles and practices underlying the application of the agglutination tests for Bang's disease, C. P. FITCH and C. R. DONHAM (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 1, pp. 46-54).—This is a contribution from the Minnesota Experiment Station, the details of which are reported in tabular form.

The drawing and handling of blood samples for the serological diagnosis of Bang's abortion disease (*Connecticut Storrs Sta. Spec. Bul.*, Nov. 1931, pp. 4, fig. 1).—Directions are given for the drawing and handling of blood samples.

Effect of trypan blue, thionin, and pyronin on the agglutination titre of cows infected with Bang's disease, E. E. SLATTER and R. GRAHAM (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 1, pp. 76-78).—In work in Illinois three groups of six animals each, positive to the agglutination test for Bang's disease, continued to show titers of 1:50 to 1:20 for eight months after treatment with trypan blue, thionine, or pyronine, respectively. No evidence was obtained to suggest that trypan blue, thionine, or pyronine altered the agglutinin titer of the blood or milk sera of the treated animals.

Treatment for mastitis with ultraviolet light, formalin, colloidal carbon, and autogenous bacterins, E. M. GILDOW, H. C. HANSEN, and V. A. CHERRINGTON (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 1, pp. 55-64, figs. 2).—In work at the Idaho Experiment Station, "no consistent reduction in the number of bacteria or leucocytes in the middle milk of cows affected with subacute or chronic mastitis was obtained following treatment with formalin, colloidal carbon, autogenous bacterins, or ultraviolet light. Four cows . . . were treated by all four methods without showing significant reductions in bacteria or leucocyte counts. Of the 10 cows treated with two or more of these methods, only 1 . . . shows a permanent recovery, as designated by a return to a normal bacteria and leucocyte count in the milk. This cow was infected with *Streptococcus subacidus*. She was treated first with ultraviolet light in September 1930, and with autogenous bacterin in March 1931. Both the bacteria and leucocyte counts were normal following the use of autogenous bacterin and have remained so on subsequent quarterly herd tests.

"No conclusive statement can be made concerning the relative effectiveness of the different treatments used insofar as correction of clinical symptoms is concerned. The limited data obtained in the treatment of these cases, however, do corroborate the findings of other investigators in that none of the treatments used was effective in eliminating the causative organism from the udder or even in regularly reducing the number of organisms or associated leucocytes."

Contribution to the diagnosis and control of paratuberculosis [trans. title], M. J. J. HOUTHUIS (*Tijdschr. Diergeneesk.*, 60 (1933), No. 1, pp. 6-16; *Ger., Eng., Fr. abs.*, pp. 14-16).—This is a report of studies of 44 bovines suffering from paratuberculosis.

Growth and metabolism of the bovine pleuro-pneumonia virus, B. E. HOLMES and A. PIRIE (*Brit. Jour. Expt. Path.*, 13 (1932), No. 4, pp. 364-370, figs. 3).—A report of studies made with a view to estimating the growth of the filter-passing organism of bovine pleuropneumonia by estimating its metabolism. There was found to be "little or no production of ammonia in cultures and no perceptible increase in amino nitrogen (formol titration). There is a very slight fermentation of glucose during the first 24 hours of culture and a very large fermentation during the second 24 hours. This increase of metabolic activity probably indicates increase in the amount of organism present. The pleuropneumonia virus can reduce methylene blue in the presence of sodium lactate. The growth of the virus in culture can thus be conveniently estimated by following the increase in lactic dehydrogenase in the culture."

Contagious bovine pleuro-pneumonia control by culture vaccines, S. C. J. BENNETT (*Jour. Compar. Path. and Ther.*, 45 (1932), No. 4, pp. 257-292).—This is a report of work conducted with the dual purpose of adapting cultures of the pleuropneumonia virus for use as vaccines in the Sudan and of ascertaining with more precision than hitherto some details of their properties and limitations. It was found that a single dose of living culture, even of many generations, will produce an immunity. Virus cultures (vaccines) stored without transplantation were found to require a longer period to produce immunity than fresh cultures.

Avian tuberculosis in cattle in Great Britain, F. C. MINETT (*Jour. Compar. Path. and Ther.*, 45 (1932), No. 4, pp. 317-330).—"The natural occurrence of avian tuberculosis in cattle in Great Britain is reported. The nature of the infection was established in three calves and in two adult bovines, belonging to three herds, but it was probable that other cases among calves existed in at least one of these herds. In two of the herds tuberculosis was proved to exist among the fowls, and these had free access to the cattle. In four instances the organisms were isolated from glands of the alimentary tract and in the fifth instance from the apparently normal intestinal mucous membrane.

"Four of the five cases were detected as a result of reactions to the intradermal johnin test, but where tests were made the animals reacted still more strongly to avian tuberculin and in a smaller degree to mammalian tuberculin. Post-mortem examination, however, failed in all cases to show the presence of bovine tuberculosis or Johne's disease. With two animals strong reactions to avian tuberculin or johnin could be elicited for a period of six months after removal from the source of infection, but at the time of slaughter one of these had apparently overcome the infection.

"The strains of avian tubercle bacilli from the calves were highly virulent for rabbits and fowls; those from two adult cattle were of low virulence, probably owing to a more prolonged residence in mammalian tissues."

Black leg in sheep due to shearing, I. E. NEWSOM and F. CROSS (*Vet. Med.*, 28 (1933), No. 1, pp. 16-20, figs. 2).—This contribution from the Colorado Experiment Station reports upon an outbreak of blackleg in sheep due to shearing wounds, 145 out of a band of 2,000 having been lost. The diagnosis was confirmed by bacteriological cultures. Some tests were made which showed the relative value of commercial aggressins and bacterins.

Vaccination against braxy with formalinised but living whole-cultures, N. DUNGAL (*Jour. Compar. Path. and Ther.*, 45 (1932), No. 4, pp. 313-316).—It is pointed out that vaccination against braxy has been practiced in Iceland since 1897. "Dried cultures prepared by the Danish Serum Laboratory and our antiserum have been most used, on the whole with good results. Since 1929 a new kind of vaccine, consisting of slightly formolized whole cultures, has been introduced by our laboratory and has given constantly better results than the Danish vaccine as shown by the vaccination reports. Although the vaccine contains a number of living spores the reactions are very slight and losses from vaccination negligible."

Contagious abortion of sheep and goats in Cyprus, F. H. MANLEY (*Jour. Compar. Path. and Ther.*, 45 (1932), No. 4, pp. 293-300, figs. 4).—A report is given of an outbreak of contagious abortion of sheep and goats in Cyprus. The causative organism is apparently closely allied to the strains of *Bacterium abortus ovis* isolated in England. The association of goats with an outbreak of this nature is reported for the first time. It was found that abortion can easily be produced in sheep and goats by artificial infection with the organism. In one small experiment two inoculations of formolized culture appeared to give complete protection against a subsequent dose of live culture, a similar dose of living culture producing abortion in a control ewe.

A liver function test in sheep, J. N. SHAW (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 2, pp. 199-204, figs. 3).—In this contribution from the Oregon Experiment Station the author reports having found that the excretory function in livers of sheep infested with both immature and mature *Fasciola hepatica* was not affected, as determined by the rose bengal dye test here described, except in one instance. "Carbon tetrachloride in doses greater than necessary to kill immature and mature flukes did not produce sufficient damage to the liver to be detected by use of this test. The excretory function of the liver

of sheep suffering from so-called pregnant-ewe paralysis was markedly affected, as indicated by the rose bengal test."

"**Tick-borne fever**", a hitherto undescribed disease of sheep, W. S. GORDON, A. BROWNLEE, D. R. WILSON, and J. MACLEOD (*Jour. Compar. Path and Ther.*, 45 (1932), No. 4, pp. 301-312, figs. 4).—The authors find that a hitherto undescribed disease occurs in sheep on at least some of the tick-infested farms of Scotland. "When transmitted by inoculation it is characterized by an incubation period of about 4 days, followed by a febrile phase which lasts about 10 days. The presence of the infective agent has been demonstrated in the blood, spleen, and central nervous system. The mortality incidence is low, and after recovery most animals are comparatively immune to further infection. In animals killed during the febrile phase the only pathological change observed is splenic enlargement. The infective agent is transmitted by the tick *Ixodes ricinus* L."

Pseudo-tuberculosis of sheep due to *B. pseudotuberculosis rodentium* (so-called "**pyaemic hepatitis**"), E. M. PULLAR (*Aust. Vet. Jour.*, 8 (1932), No. 5, pp. 181-183).—A report upon a fairly extensive and serious outbreak of so-called pyemic hepatitis in sheep which occurred in flocks in two widely separated districts of Victoria.

The effects of sulphur on merino sheep and their resistance to potassium cyanide poisoning, D. G. STEYN (*Union So. Africa Dept. Agr., Rpt. Dir. Vet. Serv. and Anim. Indus.*, 18 (1932), pt. 2, pp. 597-610, fig. 1).—It was found that merino wethers and ewes which had received sulfur over a period of 2 years showed a much greater increase in body weight and wool yield than the control animals. The controls showed a higher degree of worm infestation than the sulfur-treated sheep. Of the sulfur-dosed wethers, 37.5 percent succumbed to the effects of urinary calculi, whereas the two control wethers continued in good health. The sulfur-treated sheep showed a fair degree of resistance to potassium cyanide.

A new disease of moose, II, G. I. WALLACE, L. J. THOMAS, and A. R. CAHN (*Soc. Expt. Biol. and Med. Proc.*, 29 (1932), No. 9, pp. 1098-1100).—This second contribution (E.S.R., 68, p. 531) reports studies of the causative organism of the new disease of moose, it having been repeatedly isolated from ticks taken from a diseased animal. It has also been isolated from guinea pigs that died after winter ticks from a diseased moose had engorged upon them. The organism grows very abundantly on all ordinary laboratory media. It is a vigorous fermentor, is capsulated, and apparently produces a toxin. The growth on agar is excessively mucoid, while in broth it grows very well throughout the medium with a great deal of sedimentation. It produces beta hemolysis on blood agar. Growth is exceedingly rapid, covering the entire surface of an agar slant within five hours. Indications are that it may be a member of the *Klebsiella* group in a rod form with a tendency to assume a coccoid shape.

A new disease of moose.—III, A new bacterium, A. R. CAHN, G. I. WALLACE, and L. J. THOMAS (*Science*, 76 (1932), No. 1974, pp. 385, 386).—In this third contribution (see above), the name *Klebsiella paralytica* is applied to the causative organism of the new disease of moose.

Studies in infectious enteritis of swine.—VII, Studies on the use of colloidal iodine in swine coccidiosis, H. E. BIESTER and C. MURRAY (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 1, pp. 79-83, fig. 1).—In this further contribution on the subject (E.S.R., 68, p. 382), it is reported that colloidal iodine in large repeated doses did not in any way influence the course of controlled coccidial infections in swine. It is thought that a slight anthelmintic action against roundworms following large, repeated doses might be attributed to it.

Internal parasites of swine, M. C. HALL (*Vet. Med.*, 28 (1933), No. 1, pp. 26-33, figs. 21).—A practical, illustrated digest of the more important internal parasites of swine.

Cell proliferation response to sulphhydryl on an epithelial defect in horses, C. E. HOWELL (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 1, pp. 100-104, figs. 3).—"Evidence is here presented showing that sulphhydryl compound thiocresol definitely stimulated mitosis in one case of summer sores in horses. This defect has been one of the most resistant conditions to healing known in horses. Favorable results have been obtained by the use of the sulphhydryl group in stimulating mitosis in normal as well as persistent wounds. The successful treatment of this case of summer sores in this horse points to the fact that advantage might well be taken of the use of this substance in the treatment of persistent wounds in animals."

Bang's bacillus, *Brucella abortus*, pathogenic in the horse [trans. title], L. PANISSET and P. DELBÉ (*Rev. Gén. Méd. Vét.*, 41 (1932), No. 491, pp. 670-675).—A brief discussion of the occurrence of *B. abortus* in the horse, presented with a list of 12 references to the literature.

Infections of fetuses and foals, W. W. DIMOCK and P. R. EDWARDS (*Kentucky Sta. Bul.* 333 (1932), pp. 287-339, figs. 3).—In the studies conducted (E.S.R., 68, p. 527) streptococci were found in aborted fetuses more frequently than any other micro-organism. *Shigella equirulis*, *Escherichia coli*, and staphylococci were discovered occasionally in aborted fetuses but were of minor importance. Many instances of apparently noninfectious abortion were observed, these having occurred both sporadically and as well-defined outbreaks, the cause of the majority of which is undetermined.

"*S. equirulis* was found responsible for the death of a larger number of foals than any other micro-organism. Streptococci, also, were responsible for the death of many foals. *E. coli* and *Corynebacterium equi* were found occasionally in diseases of foals. In many instances diseases of foals were prenatal in origin. *S. equirulis* was rarely found in the genital tract of the dam of a foal that had died of this infection. This bacterium has no tendency to become localized permanently in the genital tract. *S. equirulis* was present almost constantly in the mouth and pharynx of the normal horse. Streptococci invade the uterus of the mare shortly following parturition. Sometimes they become established and produce genital infection. Through careful observation of mares that have foaled it is possible to determine whether a normal recovery is being made, and by proper care and treatment to prevent many cases of genital infection."

Spontaneous and experimental *Brucella* infection in the dog [trans. title], J. VAN DER HOEDEN (*Tijdschr. Diergeneesk.*, 59 (1932), No. 24, pp. 1446-1460; *Ger., Eng., Fr. abs.*, pp. 1455-1457).—The author examined the blood sera of 442 dogs and found that in several cases agglutinins (16.3 percent) and complement-fixing antibodies (10.2 percent) against *Brucella* were present. It appears that dogs living in a room with infected dogs may also become infected. It is pointed out that the dog must be considered as a possible source of infection in the epidemiology of brucellosis in man and animals.

Studies on canine distemper.—III, A comparison of natural and experimental virus infections, A. S. SCHLINGMAN (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 2, pp. 164-189, figs. 14).—This is in continuation of the contribution previously noted (E.S.R., 68, p. 533), presented in connection with a list of 14 references to the literature.

"A comparison of the symptoms seen occurring after natural infection with those produced in dogs by the injection of the filtrable virus indicate that these two diseases, both of which are called canine distemper, are separate

and distinct. This conclusion is substantiated further by the fact that the dogs which had recovered from natural infection, the majority of which cases have been found to be due to *Bacillus bronchisepticus*, were not immune to the virus of experimental dog distemper, and, vice versa, dogs recovered from infection with this virus were not immune to natural infection. . . .

"Ferrets recovered from fitch distemper possessed a solid immunity against infection with the virus of experimental dog distemper, but dogs recovered from fitch distemper developed either an immunity of low grade or of short duration to infection with this virus. . . . Dogs recovered from fitch distemper were not immune to infection by contact with naturally infected cases.

"From the limited number of animals used in these experiments it would seem that while fitch distemper, ferret distemper, and infection with the virus of experimental dog distemper in the dog are similar, if not identical, these conditions are entirely different from the disease in dogs as it occurs following contact with naturally infected cases, the majority of which have been found to be caused by *B. bronchisepticus*."

An encephalomyelitis in the chicken, E. E. JONES (*Science*, 76 (1932), No. 1971, pp. 331, 332).—This is a preliminary report upon a nervous disorder of chickens first observed by the author in May 1930, at which time a group of 9 affected chickens was brought to the laboratory of the department of comparative pathology of the Medical School of Harvard University. A second group of affected birds was received in April 1931, a third in January 1932, and a fourth in May 1932.

The affection is characterized by a pronounced and rapid tremor of the head and neck, with which, in some cases, there is also an associated ataxia. The age of onset of the disease is reported to be as early as 2 days after the chickens have been removed from the incubator. The oldest affected birds under observation were from 6 to 7 weeks of age. A total of 102 affected birds was studied, detailed pathological examinations of 50 of which have been completed. Transmission experiments, in which a suspension in salt solution of brain or of spinal cord of an affected bird was inoculated intracranially into very young normal chickens, gave positive results in six cases. All efforts to produce the disease by diet, high temperature, etc., have been unsuccessful.

An account of ataxia in chicks associated with nephritis, by Dunlap, contributed from the Massachusetts Experiment Station, has been noted (E.S.R., 67, p. 748).

Immunisation of the fowl and the pigeon against epithelioma contagiosum, R. E. GLOVER (*Cambridge Univ., Inst. Anim. Path. Rpt. Dir.*, 2 (1931), pp. 1-20, pls. 2).—It is concluded that "the use of emulsions containing living virus cannot be recommended for the purpose of vaccination against fowl pox. Two inoculations of virus emulsions rendered inert by heat, formalin, or chloroform are capable of inducing a fleeting immunity. A more satisfactory protection is produced by phenol-treated emulsions. The vaccine of De Blicke and Van Heelsbergen [E.S.R., 53, p. 785] is indistinguishable from pigeon virus. Both are of value in the production of an active immunity and are without danger when applied under suitable conditions. It is impossible to demonstrate antibodies in the sera of recovered or hyperimmunized birds."

Immunisation of fowls against fowl pox by use of pigeon pox virus, A. S. CANHAM (*Union So. Africa Dept. Agr., Rpt. Dir. Vet. Serv. and Anim. Indus.*, 18 (1932), pt. 1, pp. 111-140, figs. 3).—In experimental work pigeon pox vaccine produced a good immunity against natural cases of fowl pox but not so good an immunity against artificial infections with fowl pox virus. It was found that young birds a week old can be vaccinated with pigeon pox vaccine

with safety, and in no birds inoculated were any constitutional symptoms observed.

The relation of age, breed, and species to susceptibility to transmissible leucosis of chickens, E. L. STUBBS (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 2, pp. 232-242).—The author finds that transmissible leucosis of chickens can be transmitted readily to various breeds of the fowl, and that it can be transmitted to chickens of various ages, young fowls being more susceptible. It is concluded that it cannot be transmitted from chickens to birds of other species.

Observations on a severe outbreak of mycosis in chicks, E. L. JUNGHER (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 2, pp. 169-178, figs. 5).—Contributing from the Connecticut Storrs Experiment Station, the author reports studies made of mycosis in chicks, a disease that appeared during the summer of 1931 in a Connecticut hatchery and resulted in a loss of approximately 10,000 chicks of the 50,000 hatched during the season. It is thought to be the first report of a severe outbreak of the disease of major epidemiological importance. The chicks that survived made good recovery, and 60 days after hatching had developed into normal birds. The losses were smaller when brooding was carried out in small lots or batteries; change in feed and rigid sanitary precautions were not very effective as control measures.

“The diseased condition was characterized by whitish ulcers or pseudo-membranes in the crop, brownish or mucoid deposits in the proventriculus, and ulcers in the gizzard. The lesions in small chicks were often so small as to be easily overlooked. On mycological examination yeastlike fungi were isolated from the crop, proventriculus, gizzard, gall bladder, and intestine. The predominating organism was a yeastlike fungus resembling *Monilia albicans*; the other observed types resembled *Oidium lactis* and *M. krusei*. The diseased condition was reproduced by feeding fecal material from diseased chicks and by injecting fungus cultures of the *M. albicans* type. In two instances artificially infected chicks succumbed with the *O. lactis* type. Infection experiments conducted on small lots of chicks were not uniformly successful, a point readily understood when field observations of small-lot brooding are considered. The average period of incubation under experimental conditions was 31 days, a period that closely coincided with the second mortality peak under field conditions. The second mortality peak may, therefore, have been due to postnatal infection.

“The disease may appear in septicemic form, as was indicated by the isolation of virulent fungi from the liver and gall bladder; however, the extreme virulence of the infection in very young chicks, together with the slight pathological changes that occurred and the occasional presence of focal necrosis in the liver, suggests a toxemic action of the fungi.

“Day-old chicks from the hatchery developed the disease after they had been removed from the original premises. Chicks raised on wire floors in a new, isolated colony house suffered 41.9 percent losses. The first and highest mortality peak occurred about the tenth day after hatching; the average incubation period under experimental conditions was 31 days. The cloaca of laying hens affected with a moist type of vent gleet was shown to carry yeastlike fungi. When eggs from the plant were hatched in a sterilized incubator and the chicks reared in sterilized battery brooders, the disease appeared in only a few instances. These data furnish circumstantial evidence that the disease can be transmitted through the agency of the egg, presumably on the egg.

"The fact that the owner found that brooding in batteries was safer than in colony houses, and the writer's observation that only relatively small numbers of chicks succumbed to experimental infection, suggest that management may play a part in the postnatal spread of the disease."

A specific infectious disease of chickens due to a hemolytic streptococcus, C. B. HUDSON (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 2, pp. 218-231).—In this contribution from the New Jersey Experiment Stations, the author records the finding of a specific infectious disease of chickens caused by a hemolytic streptococcus. "The causative organism occurs abundantly in the blood and organs in chains of 2 to 20 cells, with chains of 6 to 8 elements predominating. The portal of entry is shown to be by way of the nasal cavity and not by way of the alimentary tract. It is demonstrated that some birds resist intranasal inoculation but become carriers of the infection, and that the organism may be isolated from the nasal cavity of such individuals. Localization of the infection following intranasal inoculation is shown in the case of two birds. The disease probably becomes established in a flock through the introduction of carrier birds or by the introduction of susceptible birds into a flock in which carriers exist."

A note on Aegyptianella pullorum in the fowl in South Africa, E. M. ROBINSON and J. D. W. A. COLES (*Union So. Africa Dept. Agr., Rpt. Dir. Vet. Serv. and Anim. Indus.*, 18 (1932), pt. 1, pp. 31-34, figs. 4).—The authors record the presence of what is thought to be *A. pullorum* in South Africa, the vector of which is unknown but is quite probably the fowl tick. The disease is not of much importance, especially in up-to-date plants where sanitary measures are applied. It is considered possible that the organism may prove to be the cause of a chronic fatal form of anemia which is not uncommonly seen, and for which so far no etiological factor has been discovered.

Pullorum disease: A study of the relationship of repeated agglutination tests to the bacteriology and pathology of the disease, F. D. MCKENNEY (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 1, pp. 65-75).—The author's studies have led to the conclusion that "the agglutination test is probably more accurate in detecting infections of pullorum disease than any method that depends on isolation of the organism from infected birds. Lesions in the ovary do not mean that a hen is necessarily affected with or is a carrier of pullorum disease; the lesions may have been produced by means other than *Salmonella pullorum*. A reaction to the agglutination test for pullorum disease is evidence of an existing infection with *S. pullorum*, and is not necessarily an immunologic reaction. Birds may recover from the disease and show no evidence of immunity by agglutinins in the blood serum. In a high percentage of fowls that have been fed the organism, infection in the ovary becomes localized."

The whole-blood, stained-antigen agglutination test for pullorum disease, E. H. BARGER and J. P. TORREY (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 1, pp. 84-92, figs. 12).—It is pointed out that "the efficiency of the stained-antigen, whole-blood agglutination test for the diagnosis of pullorum disease is dependent upon many factors. A thorough understanding of the essential technic is fundamental. The antigen must be titrated accurately and mixed with the proper amount of fresh blood. The surroundings under which the tests are made also influence the accuracy of the results. Ample light is necessary in reading the results. Artificial light must be provided on cloudy days and at all times in dark poultry houses. For this purpose, electric light from batteries or a common flashlight may be employed. Partial, flaky, or pseudoreactions must not be confused with true agglutination."

Incubator hygiene in the control of pullorum disease, R. GRAHAM and V. M. MICHAEL (*Illinois Sta. Circ.* 403 (1933), pp. 16, figs. 7).—A practical account, in which it is pointed out that formaldehyde fumigation of forced-draft incubators by either the cheesecloth method or the potassium permanganate method is of definite value in suppression of pullorum disease, but is not a substitute for disease-free flocks.

The hydrogen-ion concentration of fowl's blood in Rous' sarcoma and in infections (avian tuberculosis and salmonellosis), M. J. A. DES LIGNERIS, M. D. BERNE, and L. M. S. S. A. LOND (*Brit. Jour. Expt. Path.*, 13 (1932), No. 3, pp. 189-200).—It was found that in fowls infected with Rous' sarcoma the pH of the blood rises and remains high until just before death. It also rose in fowls infected with avian tuberculosis and *Bacterium gallinarum* and fell again in the later stages of the disease.

Types of leg disorders affecting growing chicks, R. M. BETHKE (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 3, pp. 476-479).—Contributing from the Ohio Experiment Station the author describes four different leg disorders affecting growing chicks, namely, rickets, or true leg weakness; slipped tendon, hock disease, or perosis; crazy chicks; and nutritional paralysis. Each is discussed separately with respect to cause, occurrence, symptoms, and prevention so far as known.

Leg disorders of growing chicks, R. M. BETHKE and P. R. RECORD (*Ohio Sta. Bimo. Bul.*, 18 (1933), No. 2, pp. 48-50, figs. 2).—Rickets, hock disease, crazy chicks, nutritional paralysis, and range or fowl paralysis are the conditions discussed.

Tuberculosis of avian origin in muscovy ducks, W. R. HINSHAW (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 1, pp. 111-113, fig. 1).—Contributing from the California Experiment Station, the author reports upon two cases of tuberculosis in muscovy ducks originating from the same ranch in central California. Animal inoculations with infective material from one of the ducks and the fact that the flock was associated with a tuberculous flock of chickens indicated that they were suffering from the avian type of the disease.

An outbreak of fowl-typhoid in guinea fowls (*Numida meleagris*), E. P. JOHNSON and G. W. ANDERSON (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 2, pp. 258, 259).—In a study in Virginia of a disease occurring in a flock of some 100 guinea fowls, in which 1 or 2 had been dying daily without any symptoms noticeable to the owner, the authors isolated an organism which they conclude is identical with that of fowl typhoid. The outbreak is said to have continued until about 30 percent of the birds had died. It was checked by prompt removal of the sick birds and by thorough cleaning and disinfection of the premises.

Staphylococcal arthritis in turkeys, E. JUNGHER (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 2, pp. 243-249, figs. 4).—This contribution from the Connecticut Storrs Experiment Station reports upon an infectious disease of turkeys characterized by polyarthritic symptoms, and a more or less systemic reaction is known to occur in geese and ducks and sometimes chickens and pheasants. It is caused by *Staphylococcus aureus*, and occasionally by *S. citreus*, having been described in the literature as staphylococcosis, staphylococcosis, lameness of geese and ducks, osteo-arthritis, etc.

The author has found that the disease may occur as an acute septicemia and in a chronic arthritic form. Only the arthritic form has been observed in turkeys, although the acute septicemic form may occur and should be watched for.

AGRICULTURAL ENGINEERING

[**Agricultural engineering investigations at the California Station**] (*California Sta. Rpt. 1932, pp. 21-27, figs. 5*).—The progress results of investigations on brooder ventilation and poultry house roofs; asphaltic concrete surfacing for barns and corrals; farm machinery, including cotton harvesters, crusher mowers for hay, hay choppers, and cross blockers for beets; machinery and fire for controlling weeds and insects; fire prevention; soil heaters; and orchard heaters are briefly reported.

[**Agricultural engineering investigations at the Indiana Station**] (*Indiana Sta. Rpt. 1932, pp. 14-17, fig. 1*).—The progress results are briefly presented of investigations on the combined harvester-thresher, soil erosion prevention by Mangum terraces, management of air-cooled apple storage, temperature and humidity in poultry houses, the field silage harvester, the hay and grain drier, mechanical corn production, low corn cutting, clean plowing accessories, mechanical corn picker losses, electric soil heating, electric dairy water heaters, power consumption of stationary and portable methods of spraying, and the value of grinding grains for dairy calves.

[**Agricultural engineering investigations at the Iowa Station**], J. B. DAVIDSON ET AL. (*Iowa Sta. Rpt. 1932, pp. 15-18, figs. 2*).—The progress results are briefly presented of investigations of corn production methods, including the use of corn picker-harvesters; the all-masonry barn, the use of tractors, and tractor track efficiency.

[**Agricultural engineering investigations at the New York Cornell Station**], F. L. FAIRBANKS, A. M. GOODMAN, J. C. HUTTAR, H. E. BOTSFORD, and H. W. RILEY (*New York Cornell Sta. Rpt. 1932, pp. 89, 90*).—The progress results of investigations of the ventilation of poultry houses for laying and breeding hens, and of milk-cooling equipment are briefly reported.

[**Agricultural engineering investigations at the Ohio Station**], R. C. MILLER, N. R. BEAR, C. O. REED, R. M. SALTER, V. L. OVERHOLT, E. A. SILVER, G. W. MCCUEN, M. A. BACHTTELL, W. E. WEAVER, J. S. CUTLER, and H. S. ELLIOTT (*Ohio Sta. Bul. 516 (1933), pp. 101-106, 108, 110, 111, fig. 1*).—The progress results of investigations on corn storage, effect of seed-bed preparation on corn yield, corn planters, drainage, feed mills, threshing machines, hay chopping, soil chisel and mole drainage, and methods of handling hay are briefly reported.

Surface water supply of the United States, 1931, Parts 1, 2, 5, 12 B (*U.S. Geol. Survey, Water-Supply Papers 711 (1933), pp. IX+310, fig. 1; 712 (1933), pp. VII+233, fig. 1; 715 (1933), pp. VI+172, fig. 1; 723 (1933), pp. VII+205, fig. 1*).—Of the papers which here present the results of measurements of flow made on streams during the year ended September 30, 1931, No. 711, prepared in cooperation with the States of Connecticut, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Vermont, Virginia, and West Virginia, covers the North Atlantic slope drainage basins; No. 712, prepared in cooperation with the States of Alabama, Florida, Mississippi, North Carolina, South Carolina, and Virginia, the South Atlantic slope and eastern Gulf of Mexico basins; No. 715, prepared in cooperation with the States of Illinois, Indiana, Minnesota, Missouri, North Dakota, and Wisconsin, the Hudson Bay and upper Mississippi River Basins; and No. 723, prepared in cooperation with the States of Idaho, Nevada, Oregon, and Washington, the Snake River Basin.

Surface water supply of Hawaii, July 1, 1929, to June 30, 1930 (*U.S. Geol. Survey, Water-Supply Paper 710 (1933), pp. V+101*).—This report,

prepared in cooperation with the Territory of Hawaii, presents the measurements of flow made on streams and ditches in the Territory during the year ended June 30, 1930.

Chemical character of surface waters of Virginia, W. D. COLLINS, E. W. LOHR, K. T. WILLIAMS, H. S. HALLER, and O. C. KENWORTHY (*Va. State Comm. Conserv. and Devlpmt., Div. Water Resources and Power Bul. 3* (1932), pp. [7]+148, pl. 1, figs. 7).—This report, which was prepared in cooperation with the U.S. Geological Survey, presents data on the chemical composition of rivers and streams in Virginia. The main constituents of the water are calcium, magnesium, and bicarbonate. The general softness of the waters of the Coastal Plain and of the Piedmont is evident.

Interpretation of laboratory findings in rural spring water supplies, E. K. KLINE and N. M. FULLER (*Amer. Jour. Pub. Health*, 22 (1932), No. 7, pp. 691-699, figs. 5).—In a contribution from the Cattaraugus County (N.Y.) Department of Health, results of a study of the influence of salamanders on rural water supplies are reported.

It was found that salamanders live in large numbers deep within the shale along the underground streams. At certain seasons they come to the surface and travel a distance of at least 65 ft. overland where they feed on insects, worms, fly larvae, and similar food. Should these be infected with *B. coli* through improper protection of the area from direct fecal pollution or surface drainage the salamanders become infected. They then return to the depths and throw off *B. coli* for a considerable time. Laboratory tests on such a water supply would suggest condemnation even though the supply was otherwise unpolluted.

Preparation of potable water with "Carbosteril" [trans. title], M. JAENICKE (*Gsndhts. Ingen.*, 55 (1932), No. 49, pp. 585-587, figs. 2).—The results are briefly reported of tests of a method of preparing potable water in small quantities from ponds, streams, and swamps which involved chlorination, treatment with pulverized activated carbon, and removal of the carbon by filtration. It was possible by this means to produce water from such sources which was satisfactory physically, chemically, and bacteriologically. It was found that the adsorptive action of the activated carbon reduced the bacterial content of water appreciably, but that in order to insure absolute safety in this respect chlorination is necessary.

Stream pollution by irrigation residues, C. S. SCOFIELD (*Indus. and Engin. Chem.*, 24 (1932), No. 11, pp. 1223, 1224).—In a contribution from the U.S.D.A. Bureau of Plant Industry, briefly summarized observations from the Rio Grande Valley irrigation area in Texas, the Yuma Valley irrigation area in Arizona, and the Imperial Valley irrigation area in California indicate that the normal operation of an irrigation project results in diminishing the volume of discharge of water without a corresponding decrease in the quantity of dissolved salts. In other words, the diversion of water from a stream for irrigation use operates normally to increase the concentration of salts in the stream water. From this it becomes apparent that in formulating a program for the most complete and effective utilization of the streams of desert regions, consideration should be given to the ultimate disposition of the salt burden.

It follows that the effective drainage of irrigated land, so designed and operated as to remove the residual soluble salts, is essential to the continued safe use of any water supply for irrigation. The character and quantity of the returned drainage water must be taken into account in any plans for the utilization of water from the lower part of a river in arid or semiarid regions.

Drainage of land overlying an artesian ground-water reservoir, O. W. ISRAELSEN and W. W. McLAUGHLIN (*Utah Sta. Bul.* 242 (1932), pp. 56, figs. 16).—The publication is based on data gathered under a cooperative agreement between the station and the U.S.D.A. Bureau of Agricultural Engineering. It reports investigations on the Cache Valley artesian basin area in Utah, during which a total of 773 static water-level measurements were made at more than 50 points throughout the area. Two large wells were used to facilitate pumping from the water-bearing gravels, and 25 flowing wells ranging from 2 to 5 in. in diameter were also used.

Field measurements of the direction of flow of water in soils show that water flows upward through the compact soils overlying the artesian ground-water reservoir. The piezometric surface was appreciably lowered by the flowing of water from the artesian wells. Pumping caused a marked lowering of the piezometric surface at a distance of 1,500 ft. from the pump, an appreciable lowering at a distance of 3,000 ft., and no lowering at a distance of 10,000 ft. It is physically feasible to pump water out of the gravel in large enough streams (and also large enough in total volume) to prevent the flow of water upward, and further to permit the flow of excess irrigation water and natural precipitation downward through the upper feet of soil as fast as the low permeability of the soil will let it flow. Measurement of discharge of water from tile drains in lands east of the artesian area did not show any relationship to the pumping of water from the artesian ground water reservoir.

An appendix gives detailed data.

Mole drainage, J. H. BLACKABY (*Univ. Oxford, Inst. Res. Agr. Engin., Tech. Notes Mech. Farming, No. 1* (1932), pp. 21, pls. 5).—This pamphlet brings together such information as is available on mole drainage. A bibliography is included.

Investigation on water movement in permeable earth bodies [trans. title], O. JAHN (*Wasserkr. u. Wasserwirtsch.*, 27 (1932), No. 16, pp. 181–186, figs. 9).—This is a mechanical analysis of the movement of water through earth dams, the purpose of which is to provide a theory for the use of designing engineers.

The structure of clay and its importance in foundation engineering, A. CASAGRANDE (*Jour. Boston Soc. Civ. Engin.*, 19 (1932), No. 4, pp. 168–221, figs. 31).—This is a contribution from the U.S.D.A. Bureau of Public Roads, in which an attempt is made to illustrate the fact that in the building of foundations on clay it is important that the natural structure of the clay be not disturbed, since a definite bearing value of clay does not exist.

Soil action under load shown by test, D. P. KRYNINE (*Engin. News-Rec.*, 109 (1932), No. 26, pp. 782–784, figs. 3).—The results of studies at Yale University are briefly reported in which the movement of soil under a test load was disclosed by excavating a vertical cut under the loaded area and by observing the soil movement and moisture condition.

The influence of systems of cropping and methods of culture on surface runoff and soil erosion, M. F. MILLER and H. H. KRUSEKOPF (*Missouri Sta. Res. Bul.* 177 (1932), pp. 32, figs. 9).—An investigation covering a 14-year period is described, the object of which was to determine the influence of different systems of cropping and cultural treatment on surface run-off and soil erosion. The soil on which the investigation was carried out was a rather poor quality of Shelby loam having an average grade of 3.68 percent. The plats were 6 ft. wide and 90.75 ft. long, extending lengthwise up and down the slope and ending in concrete catchment basins to receive the run-off water and eroded soil. There were originally seven of these with different cropping and cultural systems, but only six were carried without change for the 14-year period.

The average yearly precipitation for the 14-year period was 40.37 in. as compared with a 44-year average of the local Weather Bureau of 37.80 in. The average monthly precipitation during the period was somewhat above the 44-year normal for all months excepting January, February, July, and December.

During the 14-year period the run-off varied from 12 percent of the rainfall for the bluegrass sod to 30.7 percent for the land plowed 4 in. deep and kept in cultivated fallow. That from the continuous corn was 29.4, from the continuous wheat 23.3, and from the rotation 13.8 percent. The run-off from a 4-in. plowing was only 0.4 percent above that from an 8-in. plowing.

The average annual erosion per acre varied from 41 tons for the land plowed 4 in. deep and left in cultivated fallow to only 0.34 ton for the continuous bluegrass sod. The annual erosion from continuous corn was 19.74 tons per acre, that from continuous wheat 10.10 tons, and that from the rotation only 2.78 tons.

The 8-in. plowing lost annually only 0.56 ton per acre less soil than the 4-in. plowing. For the conditions of this investigation, therefore, the results fail to substantiate the common belief that deep plowing is markedly better than shallow plowing in erosion control.

During the six months of the corn production season, April to September, the erosion loss from continuous corn averaged 4.7 times that from corn grown in the rotation of corn, wheat, and clover. Similarly the run-off from the continuous corn was 2.5 times that from the rotated corn.

The number of units of run-off water necessary to remove one unit of soil varied from 34 for cultivated fallow to 1,666 for continuous sod. In general the units of run-off necessary to remove a unit of soil from the cultivated land was much less than from the cropped land.

A 4-year experiment with soybeans in rows 3.5 ft. apart, running with the slope, and an experiment of similar length with soybeans drilled 8 in. apart (all beans followed by a rye cover), showed that the run-off from the beans in rows was 84 and that from the drilled beans 74 percent of the run-off from continuous corn during the same years. Similarly the erosion from the beans in rows was 94 and from the drilled beans 43 percent of that from continuous corn.

The annual losses of plant nutrients in the eroded soil from continuous corn or wheat, as determined during a 2-year period, were shown to be as great as or greater than those through the crop grown. Under a good cropping system or grass these erosion losses were in most cases reduced to amounts much less than those through crops.

Mechanical analyses of the eroded material from the different plats showed that the uncropped plats and the one in corn lost more sand than the others, due evidently to the greater velocity of the run-off water on the bare soil surface.

American tentative standard symbols for heat and thermodynamics (*New York: Amer. Standards Assoc., Sect. Com. Sci. and Engin. Symb. and Abbrev., 1931, pp. 7*).—This set of standard symbols was prepared by the Sectional Committee on Scientific and Engineering Symbols and Abbreviations and approved by the American Standards Association.

Graphic statics, S. FAIRMAN and C. S. CUTSHALL (*New York and London: McGraw-Hill Book Co., 1932, pp. VIII+145, figs. 136*).—The fundamental principles of graphic statics are elucidated in this book and their relation shown to trusses and bents, cranes, derricks, dredges, and other machines. An appendix presents the graphical solution for certain special problems, including centroid and moment of inertia of an area and bending moments in different planes.

Stresses in simple structures, L. C. URQUHART and C. E. O'ROURKE (*New York and London: McGraw-Hill Book Co, 1932, 2. ed., pp. IX+339, figs. 260*).—This is the second revised edition of this book. It contains chapters on definitions and principles, fundamental principles of graphic statics, roof trusses, stresses in framed bents, bridge trusses under dead load, stresses in trusses due to uniform live loads, concentrated moving loads on beams and girders, concentrated moving loads on trusses, lateral forces on bridge trusses, influence lines, three-hinged arches, and deflection.

Continuous frames of reinforced concrete, H. CROSS and N. D. MORGAN (*New York: John Wiley & Sons; London: Chapman & Hall, 1932, pp. X+343, pl. 1, figs. 299*).—This book picturizes deformations in structural frames and emphasizes the importance of this process and the elementary nature of the geometry involved. It contains chapters on statics of deflected structures; geometry of deflected structures; moment distribution; haunched beams; continuous girders—maximum moments, shears, and reactions; rigid frames; influence lines; and right arches of reinforced concrete.

When to lay wood floors over concrete subfloors, M. E. DUNLAP (*Engin. and Contract., 71 (1932), No. 12, pp. 275, 276, figs. 3*).—Methods and apparatus developed by the U.S.D.A. Forest Service for determining the proper moisture conditions which will permit the laying of wood floors over concrete subfloors are briefly described and illustrated.

The transportation of wood in chutes, A. M. KOROLEFF and R. C. BRYANT (*Yale Univ. School Forestry Bul. 34 (1932), pp. XII+139, pl. 1, figs. 76*).—This report is in three parts. Part 1 deals with the form, construction, and operation of chutes, and part 2 presents theoretical considerations in gravity chute construction and operation. Part 3 contains a bibliography and presents coefficients of friction and angles of repose for chutes.

Production of insulating board from cornstalks, C. E. HARTFORD (*Indus. and Engin. Chem., 22 (1930) No. 12, pp. 1280-1284, figs. 5*).—The manufacture of insulating board from cornstalks on a commercial scale is described and illustrated. Heat conductance tests made by the flat plate method gave heat conductivity coefficients varying from 0.32 to 0.345. Data also are briefly reported from tests of moisture absorption and tensile and cross-breaking strengths.

An experimental investigation of the friction of screw threads, C. W. HAM and D. G. RYAN (*Ill. Univ., Engin. Expt. Sta. Bul. 247 (1932), pp. 62, figs. 26*).—The results of an investigation are reported the purpose of which was to determine values for coefficients of friction applicable to the present-day operation of power screws. The conclusions are in considerable detail and are useful in connection with the design of power equipment for shop purposes. An appendix deals with the friction of collar thrust bearings.

The application of electric light to agriculture, F. E. ROWLAND (*Illum. Engin., 25 (1932), May, pp. 115-123, figs. 15*).—This is a summary of information relating to electric lighting for the general farm and for the poultry farm, with special reference to conditions in England. Attention is drawn to experimental results obtained from various sources relating to the favorable influence of artificial illumination on egg production during the winter months.

The conclusion is drawn that the lighting load is comparatively so small that without the development of other uses of electricity, such as electric power and heating, rural electrification on an extensive scale would be impracticable.

Electric service for the Iowa farm.—Report No. 7, Operating cost of the individual farm electric plant, F. D. PAINE and F. J. ZINK (*Iowa State Col. Off. Pub., 31 (1932), No. 1, pp. 15, fig. 1*).—This is a continuation of the progress

report on the rural electrification project in Iowa (E.S.R., 61, p. 478). Data obtained on the cost of operation of individual farm electric plants are analyzed and discussed.

It was found that at present-day prices of individual electric plants and fuel, electricity can be generated by such plants at a cost of approximately 50 c. per kilowatt-hour when the amount generated is about 240 kw.-hr. per year. The cost of electricity from such a plant decreases as the amount generated per unit of time increases and varies from \$1 when 100 kw.-hr. are generated to less than 30 c. when 1,000 kw.-hr. are generated per year.

It was found that the monthly use of electricity is greatest in December and least in June, varying from an average of 12.5 to 29.6 kw.-hr. per month with the storage battery plants.

Rural electrification in Oklahoma: A study of consumption and costs, E. R. MILLER (*Oklahoma Sta. Bul.* 207 (1932), pp. 135, figs. 47).—The results of a consumption and cost study conducted by the station in cooperation with the Oklahoma Committee on the Relation of Electricity to Agriculture and the Oklahoma Utilities Association are reported. For this study 22 typical electrified farms located in various parts of the State but within a radius of 125 miles from Stillwater were selected. These consisted of dairy, poultry, and general farms.

Detailed data are given relating to the use of electricity on these farms for lighting, pumping water, cooking, household and dairy refrigeration, heating water, laundering, operating dairy equipment, incubation and brooding, feed grinding, and silage cutting.

Spectroscopic studies of engine combustion, L. WITHROW and G. M. RASSWEILER (*Indus. and Engin. Chem.*, 23 (1931), No. 7, pp. 769–776, figs. 5).—This paper describes a preliminary spectrographic study of the physical and chemical processes which take place in a gasoline engine.

Separate spectrographic studies made of the flame fronts and afterglows of explosions produced with several fuels in a gasoline engine, and covering the spectral range 3,500 to 6,500 Å indicated that the reactions accompanying the afterglows are different from those taking place in the flame fronts. The visible afterglow spectrum is emitted by the same molecules which give off light during a reaction between carbon monoxide and oxygen, while visible light from the flame fronts of hydrocarbon fuels in nonknocking explosions comes largely from CH and C₂ molecules. The gasoline flame fronts in the detonating zone during knocking explosions show CH and C₂ bands only faintly, but flame fronts outside of the detonating zone exhibit both sets of bands with intensities comparable with nonknocking explosions. Addition of lead tetraethyl to the gasoline removes the knock and reestablishes the CH and C₂ bands in the light from the detonating zone. Lead is present in the flame fronts as atomic lead and molecular lead monoxide.

Progress toward a uniform method of measuring detonation, T. A. BOYD (*Indus. and Engin. Chem.*, 22 (1930), No. 12, pp. 1301, 1302).—This is a synopsis of a report of the subcommittee on methods of measuring detonation of the American Petroleum Institute Cooperative Fuel Research Steering Committee.

Laboratory experiments on gum-bearing gasolines, S. P. MARLEY and W. A. GRUSE (*Indus. and Engin. Chem.*, 24 (1932), No. 11, pp. 1298–1302, figs. 4).—In a contribution from the Mellon Institute of Industrial Research, data are presented from preliminary experiments in connection with a study of the significance of gum content of gasoline as related to gum deposits. While the results were obtained with experimental equipment under laboratory conditions, they emphasize what appears to the authors to be a new importance for one of the principles of engine design.

It was found that a moderate gum content can be tolerated in an engine if the temperature of the mixture in the manifold is kept low, but as soon as much heat is applied a fuel containing an appreciable amount of gum will begin to deposit this gum, and such deposits are heavier from a rich mixture than from a lean one. The carbon deposits in the combustion chamber are somewhat but not much greater with gum-bearing fuels at low intake temperatures, but the well-known tendency to lower carbon deposits with higher head temperatures could readily be invoked to remedy this difficulty.

The results suggest that by lowering intake manifold temperatures volatile gasolines of moderate gum content might perhaps be used without serious trouble from gum deposits. Such a possibility should be considered in its relation to the application of high antiknock cracked gasolines.

Freezing and flow points for glycerol, prestone, denatured alcohol, and methanol. J. C. OLSEN, A. S. BRUNJES, and J. W. OLSEN (*Indus. and Engin. Chem.*, 22 (1930), No. 12, pp. 1315-1317, figs. 5).—In a contribution from the Polytechnic Institute of Brooklyn, N.Y., data are presented on these anti-freeze compounds.

It was found that the flow point is only a few degrees lower than the freezing point for temperatures down to -25° C. for all the materials except glycerol. Below -25° the difference tends to increase to about 7° . Commercial ethylene glycol in solutions of from 10 to 60 percent by weight and 9.1 to 57.48 percent by volume showed freezing points varying from 26.1° to -50.8° F. and flow points varying from 24.3° to 63.4° F. Synthetic methanol in solutions of from 10 to 40 percent by weight and 12.24 to 45.56 percent by volume showed freezing points varying from 19.8° to -43.6° F. and flow points varying from 16.7° to -57.1° F. Denatured alcohol in solutions of from 10 to 60 percent by weight and 11.9 to 64.66 percent by volume showed freezing points varying from 24.26° to -43.6° F. and flow points varying from 21.2° to -52.5° F.

Glycerol appears to be a considerably less efficient antifreeze than the other three materials.

Farm tractors. A. A. STONE (*New York: John Wiley & Sons; London: Chapman & Hall*, 1932, pp. VII+492, figs. 357).—Practical information is presented on the construction, operation, and repair of farm tractors.

Electric tillage (*Impl. and Mach. Rev.*, 58 (1932), No. 692, pp. 631-633, figs. 2).—A brief report is presented of field tests of a new electric tractor. This tractor consists primarily of an angle iron frame supported mainly by two broad drum wheels, inside each of which is attached a powerful motor, which is suspended from the axle and drives the wheel. A smaller stub frame is offset to the main frame and forms the mounting for a winding drum to carry the cable. A multiple-furrow plow is attached to the front and rear, making the outfit a 1-way plowing unit that avoids all open furrows.

Power is fed from the 3-phase wiring system by attaching a trolley pole to the four wires. The pole is fitted with runners to permit it to slide along rapidly. The current is subject to the operation of a main switch on the tractor and is further controlled for individual duties by other switches.

Cultivation of ratoons under unirrigated conditions on Kauai. W. P. ALEXANDER (*Assoc. Hawaii. Sugar Technol. Rpts.*, 11 (1932), pp. 3-30, figs. 34).—This is a technical discussion of standard practices in the cultivation of ratoon cane on the unirrigated lands of Kauai. The machinery and equipment used are profusely illustrated, special attention being drawn to deep tillage and pulverizing devices.

Cultivation on unirrigated plantations on the island of Hawaii. R. BRYAN (*Assoc. Hawaii. Sugar Technol. Rpts.*, 11 (1932), pp. 31-35, figs. 6).—A

brief description of cultivation practice on unirrigated plantations on the island of Hawaii is presented, and the cultivating machinery used is illustrated. It is pointed out that the machinery and methods used are adapted primarily to the interests of better weed control.

A combine reel for harvesting peas, E. N. HUMPHREY (*Agri. Engin.*, 13 (1932), No. 12, pp. 316, 317, figs. 4).—A new rake reel developed at the Idaho Experiment Station and which promises to materially reduce shattering and field losses in the combining of peas is described and diagrammatically illustrated. The mechanism has the appearance of an enlarged side-delivery rake reel mounted on the header platform.

Grinding and elevating grain with one-half h.p. motor, H. J. GALLAGHER (*Michigan Sta. Quart. Bul.*, 15 (1933), No. 3, pp. 146-151, figs. 3).—Practical information and working data are given on the subject.

Filling silos with the field ensilage harvester, A. J. SCHWANTES and J. B. TORRANCE (*Minnesota Sta. Bul.* 290 (1932), pp. 27, figs. 6).—The results of a study of field silage harvesters are reported which included 14 machines used on 35 farms. Two and one half farms and 37.3 acres was the average per machine in 1930. A capacity of about 7.5 tons, or about 1 acre per hour, might reasonably be expected under normal conditions. In most cases one man handled the silage harvester and the tractor or horses. An average of 3.6 men were employed hauling the silage from the field to the silo. On most farms one man remained at the silo to assist in unloading. In about one third of the cases a man worked in the silo.

Four teams were used for hauling silage on one half of the farms. On about one third of the farms three teams were used. The power unit for operating the blower may be smaller than that required to operate a stationary silo filler. In the field a 3-plow tractor is needed to operate the field silage harvester. This is more than is necessary for the corn binder.

The average estimated life of the field silage harvester was 10.8 years and of the blower 20 years. The total cost per acre of filling silos with the field silage harvester is \$7.83 and the cost per ton is \$1.07, based on a yield of 7.3 tons per acre and a charge of 30 c. per hour for man labor and 12.5 c. per hour for horse work. The cost of operating a 2-plow tractor was assumed to be 74 c. per hour and that of a 3-plow tractor 96 c. Labor costs are somewhat less with the field silage harvester method of filling silos than with the stationary silo filler method, but power and machinery costs tend to be about the same. There is no significant difference in total costs of the two methods. The field silage harvester equipment requires a cash lay-out about 27 percent higher than that for the corn binder and silo filler.

Dairy manufacturing machinery, B. LICHTENBERGER (*Lehrbuch der Milchwirtschaftlichen Maschinenkunde*. Hildesheim: Molk.-Ztg., 1932, pp. 370, pls. 31, figs. 185).—This book, which is written from the German viewpoint, brings together a large amount of information relating to machinery and equipment used in dairying and in dairy manufacture and discusses the design and development of such equipment for specific purposes.

Modern farm buildings, D. N. McHARDY (*London: Crosby Lockwood & Son*, 1932, pp. XII+227, figs. 85).—The subject matter of this book falls into two sections, in the first of which the principles of construction are described in nontechnical language. The second section deals with the principles of design applicable to the various classes of buildings. Chapters are included on plan drawing; concrete; concrete construction; brickwork; roofing materials; carpentry and joinery; drainage; water supply; lighting; business considerations; cowsheds; dairy buildings; housing dry cattle; stables, cart, and implement sheds; construction of piggeries; food supplies and crop storage;

miscellaneous structures; modernizing old buildings; repairs and upkeep; form of contract agreement; and specification. An appendix contains cost and dimension estimates.

Greenhouses and hotbeds, F. BÖHMIG (*Gewächshäuser und Frühbeete. Berlin: Paul Parey, 1932, pp. VIII+193, figs. 169*).—This book gives both practical and technical information on the design, construction, and use of greenhouses and hotbeds and describes equipment such as heating plants and facilities for watering. It is based entirely on German practice and experience.

Greenhouse heating, A. H. SENNER (*U.S. Dept. Agr. Circ. 254 (1932), pp. 40, figs. 26*).—This circular gives technical information relating to the design and improvement of greenhouse heating plants. It presents standard engineering data on the subject together with practical information on the lay-out and operation of modern greenhouse heating systems.

The experimental use of artificial light in connection with the growing of cucumbers in Denmark, E. STROUD (*Illum. Engin., 25 (1932), May, pp. 123-125, figs. 7*).—The results of experiments to determine the most economical intensity of illumination for cucumbers are reported. The experiments involved the use of test fields in a line occupying a space about 35 ft. long by 6 ft. wide, two at one end using 500-w lamps in intensive prismatic reflectors, two at the other end using 750-w lamps in similar prismatic reflectors, and a center space without artificial light. The reflectors were covered so that all the light was emitted in a zone of 55°. The height of the units above the new plants was 1.325 m (4 ft. 4 in.), and the position of the lamp in the reflector was such that very little light was emitted outside the test fields.

It was found that not only did the light have no prejudicial effect on the plants, but that those illuminated had greener leaves and a greater leaf area. This, in conjunction with the longer (artificial) day, created greater assimilation, and thus contributed to a more robust development of the root. The illumination therefore furnished a plant in quick and continuous development, which does not stagnate and is more capable of resistance against diseases. A natural consequence is that it becomes less necessary to plant more seeds than precisely those required to furnish the quota of plants, which means a saving in seeds, space, and attention. The plants which were exposed to artificial light maintained throughout the lead they had originally gained.

The conclusion is drawn that the illumination yielded by the 500-w lamps was apparently sufficient. No very material advantage was shown in the behavior of plants in the area lighted by 750-w lamps.

The ventilation of animal shelters, F. L. FAIRBANKS (*Agr. Engin., 13 (1932), No. 12, pp. 321-323, figs. 4*).—This is a brief description of the research procedure followed in the study of the ventilation of animal shelters at the New York Cornell Experiment Station and a summary of the main findings. The dairy stable ventilation standards tentatively established are (1) the temperatures in the stable should be from 45° to 50° F. with an allowable variation of $\pm 10^\circ$, (2) the relative humidity should be about 75 percent and not over 85 percent, (3) the air flow into and out of the stable should be from 50 to 60 cu. ft. per minute per cow and may vary from 40 to 80 cu. ft. per minute per cow in extreme cases, and (4) the internal air movement or convection currents should be positive at all times; that is, they should be constantly in operation in a certain direction to insure a complete mixing of the stable air with the fresh air in order to produce uniform temperature and humidity and air movement conditions throughout the stable, to act in the capacity of a partial insulation as they pass down the outside walls, and to evaporate superexcess moisture which appears in windows and to some extent on walls and intakes during extensive cold periods.

Good poultry equipment—one of the short cuts to greater poultry profits, J. M. MOORE (*Michigan Sta. Quart. Bul.*, 15 (1933), No. 3, pp. 197–204, figs. 11).—Various types of poultry equipment are described and illustrated, including mash hoppers, watering equipment, shades, and catching crates.

The artificial lighting of poultry houses, R. T. PARKHURST (*Scot. Jour. Agr.*, 15 (1932), No. 4, pp. 422–426).—Studies conducted at the National Institute of Poultry Husbandry in Scotland are reported in which different lighting arrangements were tested.

The morning and evening system of lighting increased the production and income, provided absolute regularity from autumn to spring, and divided the discharge of the batteries between night and morning, thereby lightening the load on the generator. The all-night lights gave disappointing results, although in the long run they were superior to all others for hens.

Experiments with electric water heaters for poultry, T. E. HIENTON and C. W. CARRICK (*Indiana Sta. Bul.* 367 (1932), pp. 12, figs. 7).—Experiments are reported which showed that electric heaters of proper capacity offer a satisfactory method for preventing freezing in poultry drinking vessels. An electric heater of more than 30-w capacity was required to prevent freezing in a 14-qt. bucket at temperatures below 15° F., under conditions prevailing during the tests. An 8-gal. fountain required a heater of more than 75-w capacity to prevent freezing in zero weather or below. Water in similar vessels froze at higher temperatures with external heaters than with immersion heaters of the same wattage. External heaters equipped with 3-heat switches used less total current than did immersion heaters having the same wattages as those of the former at high heats. Fountain warmers should be slightly larger than the bases of the fountains which they heat to prevent freezing of water in the troughs.

Some factors affecting mechanical refrigeration for dairy farms, T. E. HIENTON and E. H. PARFITT (*Indiana Sta. Bul.* 363 (1932), pp. 8, figs. 3).—Studies are reported which showed that the average current consumption for 100 lb. of milk cooled per degree F. by three dry-box type milk-cooling installations operated for one year was 0.064 kw.-hr. The average current consumption for cooling 100 lb. of milk by two storage-tank type milk-cooling installations operated for more than one year was 0.041 kw.-hr.

Heat losses in B.t.u. per 24 hours per square foot per degree temperature difference varied from 4.24 to 2.13 in five insulated milk tanks studied. Heat losses are dependent upon the amount of insulating material used in the construction of the storage box.

Of the temperatures studied, 45° was found to be the most satisfactory at which to operate a milk-cooling tank to inhibit bacterial development during a storage period of from 12 to 14 hours. Precooling of milk over a surface cooler to 70° was found to show no bacterial advantage when compared with milk not surface cooled but placed immediately in the cooling tank, but did result in less use of energy by the refrigeration unit. Agitation of the cooling medium in a wet storage tank by means of a mechanical agitator increased the rate of cooling of milk not surface cooled but caused no significant difference in the bacterial count of the milk from that cooled in tanks not agitated. The rate of cooling was faster with the use of a surface cooler than where milk, not surface cooled, was cooled in the tank and the cooling water agitated for 2 hours, but there was no significant difference in bacterial counts.

Testing of the fire resistance of building materials and structures, II, III [trans. title], R. SCHLYTER and C. MÖLLER (*Statens Provvningsanst., Stockholm, Meddel.* 57 (1932), pp. [3]+71, figs. 49; *Eng. abs.* pp. 62–67).—In a fur-

ther contribution to the subject (E.S.R., 66, p. 580), rules are presented for the fire-testing and classification of building materials, elements of structures, and the like, and the results of tests of partition walls of wood, protected by paneling, reeding, and plastering on both sides, and unprotected, are reported. Six wall types were tested, including reeded and plastered wooden walls, partition walls of 5-cm planks unprotected, partition walls lined with asbestos and sheet metal, partition walls lined with asbestos-cement sheets, partition walls lined with Gyproc sheets, and partition walls lined with Kivron sheets. The temperature of the experimental furnace was about 750° C. after 15 minutes.

The results showed that reeds and plaster, Gyproc, Kivron, and asbestos-cement sheets protect the wooden body of a wall against fire for about 15 to 20 minutes. The protective capacity of the thinner materials was generally limited to 5 minutes. It is concluded that partition walls should be faced on both sides.

Prevention and control of farm fires, edited by A. SECOR (*Chicago*: [I. D. Goss], 1932, pp. XII+13-167, figs. 12).—This is a handbook on the causes of fires and on the best methods of safeguarding against loss of life and property through them. Special attention is drawn to the fact that good construction is an aid to the prevention and control of farm fires. Other fire-protection methods are discussed.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics at the Delaware Station, 1931-32] (*Delaware Sta. Bul.* 179 (1932), pp. 6-11).—Results of investigations not previously noted include data on the financing of education in Delaware by M. M. Daugherty, showing the expenditures for education from local and State funds in 1910, 1915, 1920, 1925, and 1930, and the relative rank among the States of the Delaware school system in 1918, 1920, 1922, 1924, 1926, 1928, and 1930; and findings by H. S. Gabriel as to the acreage, varieties, and prices of and markets for early apples grown in Delaware, and by R. O. Bausman as to labor income and the cost of producing eggs, pullets, baby chicks, and broilers in a study of 115 poultry farms for the year ended September 30, 1931.

[Investigations in agricultural economics at the Indiana Station, 1931-32] (*Indiana Sta. Rpt.* 1932, pp. 39-41, fig. 1).—Brief summaries of results of studies not previously noted are included as follows: Farm layout in its relation to fencing costs and farm organization; human factors in farm management, made in cooperation with the Bureau of Agricultural Economics, U.S.D.A., and based on data regarding 183 farmers; the validity of certain measures of farm operating efficiency based on 280 records in the central part of the State; costs and incomes of 34 local grain elevators in western Indiana during the crop year 1930-31; labor income on 22 farms operated chiefly with mechanical power; cost of husking corn during the 1931 season on 21 farms using 1-row and 41 farms using 2-row pickers; and the consumption of electricity on farm operations.

[Investigations in agricultural economics at the Iowa Station, 1931-32] (*Iowa Sta. Rpt.* 1932, pp. 8-15).—Investigations not previously noted are reported on briefly as follows: Elasticity of Supply of Corn and Hogs for the Different Types of Farming Areas of Iowa, by T. W. Schultz and A. G. Black; Stock-Share Farm Leasing, by M. Peck; Packer Demand for Iowa Hogs, by P. L. Miller, I. W. Arthur, and M. D. Helser, including data on reshipments at terminal markets for slaughter; Destination and Origin of Iowa's Commercial Corn and Oats, by R. C. Bentley and P. L. Miller, summarizing findings for

the years 1923-24 to 1929-30, inclusive; Secular, Annual, and Monthly Movements in the Price of Cash Corn, by G. S. Shepherd; Iowa Farm Land Values, by M. Peck; Seasonal Fluctuations in Marketing Iowa Hogs, by P. L. Miller; The Place of Pasture in Iowa Farming Types, by A. G. Black, C. L. Holmes, E. B. Hurd, and H. D. Hughes, including data showing the relation of topography and soil type and the percentage of land in pasture; The Utilization and Cost of Farm Power, by A. G. Black, J. A. Hopkins, Jr., A. B. Caine, and J. B. Davidson, including findings on the profitableness of the use of mechanical corn pickers in 1931; and Recent Trends and Present Status of Farmers' Elevators, by F. Robotka.

[Investigations in agricultural economics and farm management at the New York Cornell Station, 1931-32] (*New York Cornell Sta. Rpt. 1932*, pp. 80-89).—Results of investigations not previously noted are reported as follows: Factors affecting the cost of production and returns per hour of labor in growing potatoes, found in a study of F. L. Underwood; the average labor incomes in 4 counties found by L. C. Cunningham in a study of dairy management; data regarding the distribution of grapes grown in different States, the cost of packing grapes in central New York and the Chautaugua-Erie grape belt and of distribution in Philadelphia and Chicago, and returns to country shippers for U.S. No. 1 and ungraded Concord and ungraded Niagara grapes, found in a study made by M. P. Rasmussen of the marketing of eastern grapes, in cooperation with the U.S. Department of Agriculture and the Federal Farm Board; and some findings of Rasmussen in a study of the marketing of New York potatoes and of W. C. Hopper in a study of public produce markets in New York.

Included are some brief findings of G. F. Warren and F. A. Pearson in studies of the physical volume of production of agricultural and other products, of the purchasing power of wages, and of debts in the United States, of gold and prices, of efficiency in the use of gold, and of world gold production and world monetary stocks of gold.

Brief reports are made of the study of index numbers of prices at New York, 1720-1800, by H. M. Stoker; and of the findings as to grades, prices received for different grades, and factors affecting consumer's preferences, in a study by A. R. Gans of the relation of price to the quality of eggs in New York City; of relative average assessed value of land per acre, tax delinquency, and school enrollment in rural schools in different land-class areas, as found by A. B. Lewis in a study of land utilization in Tompkins County; and of the sources of short-time and mortgage credit of New York farmers, found in a study by G. W. Hedlund.

[Investigations in agricultural economics of the Ohio Station, 1931-32] (*Ohio Sta. Bul. 516 (1933)*, pp. 96, 97, 98-100).—Results of investigations not previously noted are reported, included data as to the changes from 1925 to 1929 in the total volume of agricultural production, physical volume of sales, and farm population of the State, by J. I. Falconer; a table by H. R. Moore and F. L. Morison showing the average property taxes per farm and the number of bushels and acres of wheat required to pay such taxes in 1919, 1920, and the years 1927-32; a table by C. G. McBride and R. W. Sherman showing the 1930 population of 8 population centers of the State, the number of farms under board of health inspection, and the ratio of population to number of inspected farms in the milk sheds of the 8 population centers; a table by G. F. Henning showing the trucking area, in square miles, from which truckers obtain 50 per cent of their volume in 4 selected areas of the State; and a table by C. W. Hauck showing the retail sales at roadside markets of various types.

[Investigations in agricultural economics of the Ohio Station] (*Ohio Sta. Bimo. Bul.*, 18 (1933), No. 2, pp. 55-59, fig. 1).—Of the three articles here included, Rural Ohio's Contribution to Road Finance, by J. F. Dowler, contains a table showing for 1931 the tax revenue collected for roads by different levying jurisdictions and other data. Trends in Farm Taxes, Prices of Farm Products, and Farm Real Estate Values, by H. R. Moore, shows by a chart the annual indexes of farm taxes paid and the prices of farm products and of farm real estate in Ohio, 1900-1932. Index Numbers of Production, Prices, and Income, by J. I. Falconer, brings the data previously noted (*E.S.R.*, 68, p. 840) through December 1932.

The value of crop rotation in the Coastal Plain area, R. H. ROGERS and H. B. MANN (*North Carolina Sta. Bul.* 280 (1933), pp. 31, fig. 1).—Experimental results obtained at the Upper Coastal Plain Substation from 1924 to 1931, inclusive, with a 2-year rotation of corn and cotton (system 1), and a 4-year rotation of corn, rye, cotton, and oats and vetch hay, there being an acreage of each crop each year (system 2). A third system is also presented consisting of the 4-year rotation with livestock and a garden added. Using fields of 10 and 20 acres as a basis, tables are given showing for the three systems illustrative cropping plans, yields, rates of seeding, fertilizer used, disposal of crops, labor requirements, inventories, and receipts, expenses, and return on investment. Some suggestions are made for changes in the 2- and 4-year rotation plans and for other rotations as follows: Two-year rotation of tobacco and cotton including winter cover crops, 3-year rotation with tobacco, corn, cotton, soybeans, peanuts, and cover crops; 4-year rotation with tobacco, corn, cotton, soybeans, and cover crops; and 2-, 3-, 4-, and 5-year general rotations with corn, soybeans, small grains, cotton, lespedeza, and cover crops.

Findings as to the three systems were as follows: Average inventory valuation (1) \$4,035, (2) \$4,130, and (3) \$5,821; receipts, (1) \$653, (2) \$822, and (3) \$1,258; expenses, including decrease in inventory on unpaid family labor and operator's labor, (1) \$792, (2) \$649, and (3) \$968; value of produce for family living produced on farm, (1) and (2) \$20, and (3) \$440; and amount available for luxuries, improvements, savings, etc., (1) —\$335, (2) —\$50, and (3) \$197.

Factors in the organization and successful operation of Louisiana rice farms, 1930, R. J. SAVILLE (*Louisiana Stas. Bul.* 233 (1933), pp. 51, figs. 7).—This bulletin analyzes the financial results of the farm business and the costs of producing rice in 1930 on 302 farms in the prairie rice section of Louisiana. Charts show the relation of the prices, 1921-30, of rough rice and cotton and all commodities, and of the prices, 1913-30, of rough rice and rice farm machinery and Louisiana farm wages. Tables show the average (farms usually grouped by size) animal units of livestock, investment by items, receipts, total expenses, and cash expenses, and the labor income, 1929 and 1930. The effect of size of business, crop yields, labor efficiency, balance of farm business, and cost of producing rice on labor income, and the relation of yields and acreage of rice and cost of production are discussed. Other tables present data as to costs of irrigation, use of tractors, and truck and automobile operation.

Of the average gross receipts of the farms, 92 percent was from rice sales. Cotton sales comprised 97 percent of the balance and livestock \$160 per farm. Labor income averaged —\$256, that of about 50 percent of the farmers being between +\$500 and —\$500, and that of 85 percent between +\$1,500 and —\$1,500. In 1930, 41 percent of the farmers had plus labor incomes as compared with 89 percent in 1929. The average rent for rice land, based on cash share rentals, was \$6.75 per acre. Full-owner operators had a farm rental equivalent of \$3.21 per acre, of which \$1.80 was needed to pay taxes.

Rate of crop production was the most important factor affecting labor income in 1930. Size of business was not so significant as usual in 1930 unless combined with better than average conditions of yield, price, and labor efficiency. Farmers obtaining all of their gross receipts from rice did not receive as high average labor incomes as those obtaining part of their receipts from other sources.

The average cost of producing rice was \$3.57 per barrel, of which 56 percent was current cash outlay, 12 percent interest, depreciation, and unpaid family labor, 16 percent land rent, and 16 percent operator's wage and management charge. Irrigation outlay of private plants was materially lower than competitive water rents only for Diesel engine plants flooding 225 acres or more. Paying cash water rent was profitable only when rice yields were above the average.

Organization and management of Maryland farms: Piedmont Plateau region, S H. DEVAULT and R. HURLEY (*Maryland Sta. Bul. 337 (1932), pp. 155-212, figs. 10*).—The results are presented of a farm management study including 282 farms in 1928, 270 farms in 1929, and 279 farms in 1930, of which 52 percent were dairy, 20 percent general, 16 percent cash crop, 6 percent poultry, and 6 percent livestock farms. The region and agricultural conditions during the three years are described. Analysis is made of the effects of type of farming, size of business, crop yields and animal production, efficiency of operation, combination of the above factors and materials of production, and the selection and combination of enterprises on farm profits upon the farms as a whole and for each type of farm. Some examples of successful farms are described. Recommendations are made for improvements in organization and management of farms in the area.

The average labor incomes for all farms were in 1928, \$652; 1929, \$156; and 1930, —\$559. The percentages of farms having plus labor incomes in the respective years were 64.2, 57.8, and 36.9. The 3-year averages for the different types of farms were for dairy farms \$318, general \$174, cash crop —\$647, poultry \$492, and livestock —\$745.

The most profitable farms were somewhat larger than the average, their yields of crops were from 20 to 25 percent above the average, the animal production per unit usually one third above the average, and the labor expense per \$100 of receipts less than 50 percent of that on the least profitable farms. The more efficient operators economized in the use of purchased feed, fertilizer, and lime, and used more machinery and less labor on the same area. There was evidence that labor income decreased as the amount of feed purchased per cow increased.

“Opportunity for making the largest profit appears to be in adapting a system of farm organization that includes one major enterprise, suited to conditions on the individual farm, and one or more minor supplementary enterprises. Each of these should be large enough to permit of efficiency in operation, and they should be so combined as to provide full-time employment for the farm operator, his family, and hired labor. Such a system provides also for the maintenance of soil fertility and the economical utilization of the by-products, such as straw, corn stover, etc.”

Economic efficiency of the farm layout in Maryland, A. B. HAMILTON and S. H. DEVAULT (*Maryland Sta. Bul. 338 (1932), pp. 213-260, figs. 36*).—“This bulletin reports the results of a study of the layouts of 127 Maryland farms, the object being to trace the development of farm layouts, to measure the relative efficiency of different farm layouts from the standpoint of conveyance used

in getting from the house to the different parts of the farm, to study the arrangement of the farmstead, to determine the economic loss in haying small, odd-shaped fields, and to measure the efficiency in the use of labor and machinery on large and small farms as well as on fields of different size and shape."

Factors to be considered in locating and planning the farmstead and such factors in planning fields as size, shape, obstructions, and type of fences are discussed. Maps show examples of existing good and poor layouts. The rearrangement of three existing farms is shown and discussed.

Following are some of the findings regarding the 50-acre and less, 101- to 150-acre, and of farms over 200-acre groups, respectively: Total capital invested \$7,053, \$16,686, and \$30,881; percentage of total capital in land 32.3, 47.1, and 55.5, in dwellings 30.5, 16.4, and 10.6, in other buildings 21.8, 18.2, and 13.7, in livestock 12.4, 14.2, and 17.6, and in machinery 3, 4.1, and 2.6; size of farmed fields 5.8, 16, and 34.4 acres; number of cropped acres 27.4, 96.5, and 212.2; acreage of crops per man 21, 42, and 76; average distance from barn to cropped fields 149.4, 228.8, and 230 yd.; and value of machinery per cropped acre \$7.89, \$7.30, and \$3.90.

Some of the findings regarding the farms grouped as having good, fair, and poor layouts were, respectively, as follows: Average labor income in 1929 \$1,753, \$1,032, and \$133, and in 1930 \$294, —\$0.50, and —\$338; total acreage 143, 132, and 156; crop acres 112, 106, and 102; value of machinery per crop acre \$5.59, \$4.39, and \$4.16; size of fields 17.3, 16.9, and 14.3 acres; crop acres per worker 57.3, 55.4, and 47.4; distance to fields 193, 209, and 224 yd.; and size of farmstead 1.4, 2.6, and 3.2 acres.

The effect of certain farm practices on crop and livestock returns on central Michigan farms in 1931, P. F. AYLESWORTH and E. B. HILL (*Michigan Sta. Quart. Bul.*, 15 (1933), No. 3, pp. 160-166).—The data were obtained from 268 farmers keeping financial records on survey blanks containing questions on the approved practices outlined by the Michigan State College. Analysis is made of the data from 80 medium-size farms (from 85 to 125 tillable acres). Tables show for the 20 high and the 20 low farms the crop practices (farms sorted on the basis of crop production per acre), dairy practices (farms sorted on the basis of dairy sales per cow), and poultry practices (farms sorted on basis of egg sales per hen). Other tables show the effects of six crop practices on the value of crops per tillable acre, of eight dairy practices on the value of dairy sales per cow, of seven poultry practices on the value of egg sales per hen, and the combined effect of different numbers of such practices used on the returns from the enterprises.

Changes in farming in Lake and Porter Counties, Indiana, as a result of nearness to industrial cities, L. ROBERTSON (*Indiana Sta. Bul.* 365 (1932), pp. 20, figs. 12).—This bulletin is based on data for 1920 and 1930 for 60 farms in Lake and Porter Counties and 65 farms in Clinton County, a county about 90 miles farther south in the State but comparable as to climate, soils, etc. Tables are given and discussed showing per farm for the 2 areas for the 2 years the average number of livestock of different kinds; average crop acreages; the crop, dairy, hog, and poultry practices; and data as to power, labor, machinery, fencing, and home conveniences.

The nearness of Lake and Porter Counties to the heavily populated industrial region has resulted in improved markets for milk, poultry products, fruit, and vegetables; has increased labor costs and problems and farm land prices and taxes; and has impeded farm improvements and detracted from rural community life. It is largely responsible for the dairy type of farming in northwestern Indiana and the emphasis on poultry production instead of on the production of hogs, sheep, and beef cattle. Fewer crop equipment changes were made on

Lake and Porter County farms than on farms in central Indiana, and crop production per worker increases were greater than in the latter section.

The agricultural emergency in Iowa, I-VI (*Iowa Sta. Circs.* 139 (1932), pp. 8; 140, pp. 9-23; 141, pp. 25-38; 142 (1933), pp. 41-55, figs. 4; 143, pp. 57-71, fig. 1; 144, pp. 73-104, figs. 5).—This series of circulars discusses the various phases and causes of the agricultural situation in Iowa and some remedies proposed.

Part 1, the situation today, by A. G. Black, outlines the existing conditions. Part 2, by G. Shepherd, discusses the causes of the emergency. Part 3, by T. W. Schultz and Black, points out the essential features of the voluntary domestic allotment plan for certain agricultural products as contained in the Norbeck-Hope bill pending in Congress. Part 4, by W. G. Murray and R. C. Bentley, on the Iowa farm mortgage situation, is a revision of the report previously noted (E.S.R., 58, p. 381). New data are presented and the statistical series brought up to October 13, 1932. Part 5, by Shepherd and W. Wright, discusses general price control, the need for such control, and what the Federal Reserve System has done to check deflation. Part 6, by J. A. Hopkins, Jr., deals with the tax situation in the State, discussing the receipts and expenditures for different purposes and the indebtedness of different governmental units.

Emergency farm adjustments in the wheat area of South Dakota, R. S. KIFER, P. CHRISTOPHERSON, and S. E. JOHNSON (*South Dakota Sta. Circ.* 8 (1933), pp. 25).—This circular, prepared in cooperation with the Bureau of Agricultural Economics, U.S.D.A., describes what some farmers in the spring wheat section of South Dakota have done to reduce expenses or shift production to make their incomes equal expenses. The adjustments to reduce expenses are illustrated by a livestock farm, and those to make better use of equipment and labor and to adjust indebtedness, those taking into account changes of ownership, those on a rented farm, and those on a farm with no indebtedness are illustrated by data for individual farms.

The adjustments have taken the form of reduced cash expenses; reduction of capital assets; using family labor and equipment to the limit of capacity; increase of acreage of cash grain in some cases at the expense of feed grains, legumes, and a long-time advantageous cropping system; shifting herds of stock cattle to dairy production; shifting from a conservative production program to a more speculative one of feeding livestock; and, in extreme cases, the relinquishment of title to farms and continuing operation as tenants.

A review of the accuracy and timeliness of outlook statements, C. O. YOUNGSTROM (*Idaho Sta. Circ.* 62 (1932), pp. 28, fig. 1).—Tables are included showing for potatoes, wheat, clover and alfalfa seed, beans, sheep, beef cattle, dairying, poultry and eggs, and hogs, by years beginning 1924 to 1926 to 1931, inclusive, extracts from the annual outlook reports of the Bureau of Agricultural Economics, U.S.D.A., and the average Idaho farm price of the products for the year to which the forecasts pertain. The outlook reports available are discussed and the dates of issuance given.

"A review of the first six annual outlook reports indicates that they ranged from 84 percent to as high as 94 percent correct. This is in substantial agreement with the review presented in this circular."

The agricultural outlook for 1933 (*U.S. Dept. Agr., Misc. Pub.* 156 (1933), pp. 99).—This report, which continues the series previously noted (E.S.R., 67, p. 181), was prepared by the staff of the Bureau of Agricultural Economics, assisted by representatives of the State agricultural colleges and extension services and the Federal Farm Board. It "summarizes facts, not readily avail-

able to farmers, on the supply, demand, and price aspects of the principal crops and classes of livestock. These facts are analyzed and interpreted so far as possible to show the probable trend of conditions during the coming year in order to aid farmers in making plans for the season's operations. The statements are necessarily general in nature, because this report is prepared from the national viewpoint." Domestic demand, foreign competition and demand, agricultural credit, farm labor, equipment, and fertilizers, farm family living, the outlook during 1933 for different crops and different classes of livestock and livestock products, and the long-time agricultural outlook are dealt with.

Agricultural outlook for Illinois, 1933 (*Illinois Sta. Circ. 402 (1933)*, pp. 40, figs. 9).—This circular discusses the general agricultural situation and the outlook for 1933 for feed crops, hay, feedstuffs, different field crops, different kinds of livestock and livestock products, fruits, vegetables, and forestry.

Farmer opinions and other factors influencing cotton production and acreage adjustments in the South, T. B. MANNY (*U.S. Dept. Agr. Circ. 258 (1933)*, pp. 42).—This circular reports the results of a study in which 834 farmers in 11 counties of the Mississippi Delta, the Piedmont, and the South Atlantic Coastal Plain cotton-growing areas were interviewed. Its objectives were "(1) to note recent changes in acreage planted to cotton and to other important crops. (2) To learn the reasons given by farmers for planting the specific acreages they did. (3) To determine, if possible, the premises upon which these farmer decisions were based and the sources of information used in arriving at decisions of this kind. (4) To note the extent to which interviewed farmers received and utilized the outlook information prepared and distributed by Federal and State agencies. (5) To note general differences as regards the acreage adjustments between farmers as classified by various factors such as size of farm, tenure, schooling, length of farm experience, etc. (6) To discover the chief sources of resistance to adjustments in the farm business, especially sources that are not exclusively economic in character."

The annual changes in cotton acreage, 1926-31, and the reasons for the changes; the influence of the 1930 price of cotton, credit, and the attitude of local business men on the 1931 acreage; the influence of long-time farming plans, short-time considerations, tenure, size of farm business, and schooling of farm operators on acreage adjustments; the adjustments in fertilizer use, 1928-31; the sources of economic information regarding cotton and the use made of such information; and the production of crops other than cotton are discussed. Some observations based upon enumerators' notes are made on the effect of material changes in the cropping system on the economic and social structure of the cotton areas, the cropper problem, the climate, and production credit.

The study showed the need and opportunity for more ingenuity in meeting farm management problems; a hopeful movement toward the home growing of feeds and foods; that acreage adjustments are based too much on retrospect and too little on current conditions or prospects; a recognition by many farmers that there are some opportunities to replace cotton with other crops or farm enterprises; a commendation by the more progressive farmers of the live-at-home campaigns of the extension services; that the live-at-home goal is the most effective means of encouraging cotton acreage adjustments; that members of cooperative cotton-marketing associations are decidedly more likely to use economic information as a basis of adjustments than are non-members; that a majority of the farmers rely on daily papers for economic information, but many are unable to interpret it and the information is not

always sufficient to give an adequate understanding of current conditions; that home economists can render a valuable service in encouraging rational adjustments in the farm business; and that any attempt to stimulate more rational planning and management on individual farms must take into account not only economic factors but also social and psychological factors.

Foreign government legislation affecting wheat, G. P. BOALS (*U.S. Dept. Agr., Bur. Agr. Econ., Foreign Serv. Rpt. 58 (1932), pp. 54, fig. 1*).—Legislation in effect in 1932 in the several countries of the world is briefly discussed.

The domestic allotment plans for the relief of agriculture: Selected references, compiled by L. O. BERCAW (*U.S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 41 (1933), pp. II+[51]*).—This mimeographed bibliography includes 191 selected references on the allotment plans advocated. Most of the references are to publications during 1932 and 1933.

The farm real estate situation, 1931–32, B. R. STAUBER (*U.S. Dept. Agr. Circ. 261 (1933), pp. 51, figs. 11*).—This circular continues the study previously noted (*E.S.R.*, 67, p. 80) and covers for most of the data the year ended March 1, 1932.

The index of estimated value per acre of farm real estate (1912–14=100) decreased from 106 of the previous year to 89. The decreases in the different geographic divisions of the United States were for New England from 126 to 116, Middle Atlantic 101 to 96, East North Central 87 to 73, West North Central 97 to 81, South Atlantic 116 to 96, East South Central 117 to 97, West South Central 121 to 97, Mountain 100 to 82, and Pacific from 140 to 118.

Maps based on the 1930 Federal census reports are included and discussed showing on April 1, 1930, on a county basis the value per acre of farm real estate and of farms, including land, buildings, livestock, and equipment, and by States the value of farm dwellings on April 1, 1930, and the percentage change, 1910–30, of the aggregate value of farm real estate.

Gross income from farm production in 1931 declined 26 percent from 1930, being practically the same as for 1913 and \$2,000,000,000 lower than the low point of the 1920–21 depression. The price indexes in March 1932 for farm products were below the 1910–14 average by the following percentages: Grain 49, meat animals 31, cotton and cottonseed 50, dairy products 24, poultry products 39, and fruits and vegetables 27. The index of prices of commodities used in production was 12 percent, and that for commodities used for consumption 15 percent, above the 1910–14 average.

The number of farms changing ownership by voluntary sales and trades decreased from 19 per 1,000 for the year ended March 15, 1931, to 16.2 per 1,000 for the year ended March 15, 1932. The changes due to delinquent taxes increased from 7.4 to 13.3, and those due to foreclosure of mortgages, bankruptcy, etc., increased from 18.7 to 28.4 per 1,000. In the East North Central States, voluntary sales dropped from 18.6 to 16.8 farms per 1,000, sales by reason of tax delinquency rose from 4.7 to 6.5, and transfers due to mortgage foreclosures, bankruptcy, deeding back, and related defaults increased from 19.3 to 27.8 farms per 1,000. In the West North Central States, the changes were from 18.9 to 14.2, from 5.5 to 8.7, and from 25.8 to 43.8 per 1,000 farms, respectively.

Farm mortgage credit and farm real estate taxes are discussed briefly.

“Significant among the developments in the farm real estate situation during the year 1931–32 have been the greatest declines in values since 1921–22, a further substantial increase in the number of distress sales, a continued decrease in the number of voluntary sales, a continuation of the movement to farms on the part of unemployed, and further extension of a policy of leniency

toward foreclosing on the part of loaning agencies. These developments are associated with the continued decline in the price level which has accompanied the depression, and which has reduced gross income from agricultural production to very near the pre-war level. Fixed charges based upon previous valuations have augmented the depressing effects of reduced income."

An analysis of the loaning operations of the Federal Land Bank of Springfield from its organization in March, 1917, to May 31, 1929, F. F. HILL (*New York Cornell Sta. Bul.* 549 (1932), pp. 107, figs. 4).—The data presented are from a statistical study of the bank previously noted (E.S.R., 65, p. 682), and the discussion is centered around the bank's loaning operations in New York. The distribution of loans, foreclosures and losses, the sale of acquired farms, and the foreclosures among loans made by different appraisers are discussed. Analysis is made of the relation between foreclosures and soils, appraised value per acre of the farm and per acre of the tillage land, elevation, location relative to markets, type of road and distance to market, appraised value of farm buildings, acreage in farms, type of farming, place of origin and previous farming experience of borrowers, age of borrowers, transfers of loans, borrower's equity in the farm, manner in which farm was acquired, and the year in which the loan was made.

An appendix includes a brief description of the organization of the Federal land bank system, tables showing the location and territory of the 12 Federal land banks, amortization and miscellaneous tables, and the tabulating card forms and appraisal form used by the Federal Land Bank of Springfield (Mass.).

An economic analysis of farm mortgages in Story County, Iowa, 1854–1931, W. G. MURRAY (*Iowa Sta. Res. Bul.* 156 (1933), pp. 361–423, figs. 12).—In this study made in cooperation with the U.S.D.A. Bureau of Agricultural Economics, analysis was made of all the mortgages placed on farm lands in the county from 1854 to 1931, inclusive. The trend of the mortgage debt during the periods of land settlement, 1854–79, of rising land values, 1880–1910, of price inflation, 1911–20, and of price deflation, 1921–31; the short-time changes, including the purpose of loans, foreclosures, and the influence of changes in the prices of farm products; the sources of loans; interest rates; and term and duration of loans are discussed. Indexes of the mortgage situation were prepared, and a table is given showing, by years 1910–31, the indexes of outstanding debt, acreage mortgaged, debt per acre, sale price of land, prices of farm products, number of land-purchase mortgages, and number of foreclosures and assignments. The defaults, 1921–31, and the debt by townships and individual farms are also discussed. The appendix includes tables showing, by years 1854–1931, the number of mortgages filed, released, and outstanding, the acreage covered by and the amount of first mortgages, the amount of junior mortgages, percentage of land mortgaged, debt per acre mortgaged, sale price per acre, number of foreclosures, index of prices of farm products, numbers of land-purchase transactions and land-purchase, renewal, and former-owner mortgages, and the distribution of outstanding debt by lenders. Some of the findings are as follows:

In the earlier years, private lenders and the county school fund were the principal sources of credit. The later years showed a declining percentage total to private investors and a rising proportion to insurance companies. From 1880 to 1900 local mortgage brokers selling to private investors were responsible for most of the assigned mortgages. Since 1920, State-wide loan companies selling to insurance companies have made practically all of the assignments. Assignments at no time constituted over 20 percent of the loans

executed. Lenders in the county and adjoining counties extended 50 percent of the credit throughout the period. Except prior to the Civil War, 5 years was the most common term specified for mortgage loans and the most common duration of loans. The total mortgage debt outstanding at the close of 1910 was \$5,900,000; 1920, \$22,900,000; and 1931, \$18,000,000. The percentages of land mortgaged in the respective years were 45, 58, and 59, and the average debt per acre \$37, \$111, and \$86. Of the farms with mortgage indebtedness in 1931, 31 percent were mortgaged for \$100 or more per acre, 32 percent between \$75 and \$99, and 37 percent for less than \$75. Only 4 percent had a debt of less than \$25 per acre.

Farm mortgage foreclosures in Minnesota, E. C. JOHNSON (*Minnesota Sta. Bul.* 293 (1932), pp. 31, figs. 6).—Tables are included and discussed showing the ratio of mortgage debt to value of land and buildings per mortgaged farm in Minnesota, 1910, 1920, 1925, and 1930, and the number of tracts and acres of land sold at sheriff's sale in individual counties in four sections of the State, by years 1920–31. From its organization in 1917 to December 31, 1930, the Federal Land Bank of St. Paul made 12,548 loans, totaling \$58,704,200, on Minnesota farms, of which 8,456 loans with a net principal of \$36,130,904 were outstanding on December 31, 1930. Tables show for these loans up to April 30, 1930, and for 433 of the farms on which foreclosures were made, the farms being grouped by districts of the State and according to whether the farms had been foreclosed on or whether the loans were in good standing, the number and amount of loans and foreclosures, assets and liabilities, and appraised value of land and buildings at the time the loans were made and at the time of foreclosure; percentage of loans made in different years; average mortgage debt per acre at the time of purchase and under the loans made; appraised value per acre and for house and other buildings; value of machinery and of livestock per 100 acres; average number of milk cows, other cattle, and hogs; size of farms; age of farmers; and causes of failure of farmers. The relations of land values in a number of Minnesota counties and of soil and productivity of land in Pope, Swift, Stearns, Kandiyohi, Norman, and Goodhue Counties to foreclosures and the bona fide sales of tracts of land and foreclosures on good and poor soils in representative townships of Pope and Swift Counties are analyzed.

Some of the findings were as follows: Failure of farmers have been more numerous in the northern than in the southern part of the State, although recently there have been many foreclosures in the southern part due largely to the decline in the price of hogs. On the whole, the indebtedness has been higher on the farms foreclosed on than on those with loans in good standing, due partly to higher purchase prices but perhaps more to the fact that the operators have had less ability, there being evidence that the farms foreclosed on were not so well organized or so well managed. Failures of farmers were relatively greater on the poorer lands. Unless there is a substantial increase in the prices of farm products, many farmers will ultimately fail unless creditors will make adjustments. To avoid a repetition of present conditions, credit policies must be changed. Appraisals for loans must be based on probable earnings of the land over a long period rather than on sale values at a particular time, risks in particular regions must be considered, payments on principal should be required during the life of the loan and additional payments encouraged in years of good returns, and careful attention must be given to the reasons for borrowing, and to guiding farmers with respect to the use of capital.

State and local tax revision in Colorado, G. S. KLEMMEDSON (*Colorado Sta. Bul.* 398 (1932), pp. 124, figs. 7).—This study was designed to serve as a basis

of equalization of taxes in Colorado. It was initiated in response to a consensus of opinion that farmers, ranchmen, and home and other real estate owners of the State were paying more than their share of the cost of government. The view was held that real estate should bear no more than 50 to 60 instead of 85 percent of the total tax burden.

Through reduction in assessments and failure to collect taxes, the State was forced into a serious situation. Collections dropped from an average of 97.8 percent in 1926 to 92.56 percent in 1930. The percentage of 1931 taxes collected in 1932 approximated 88, or a loss of 12 percent, which compares with a loss of 7.5 percent in 1930, when the taxes collected varied from 37.58 percent in Costilla County to 98.91 percent in Phillips County.

The conclusion was reached that the redistribution of the tax burden in Colorado as a relief to farmers, stockmen, small home owners, and real estate owners would help to improve general business conditions and restore prosperity to the State. The advantages and disadvantages of various forms of taxation are discussed in detail.

The University of Nebraska tax primer, edited by G. O. VIRTUE (*Nebraska Sta., 1932-1933, pp. [194]*).—This consists of Tax Circulars 1-12, constituting a series of 12 chapters written to supply information for Nebraska taxpayers as follows: (1) Public Expenditures, by G. O. Virtue (pp. 16), discusses public expenditures and taxation, the growth, classification, and control of expenditures, and why they have grown and remain high; (2) Public Revenues—Their Forms and Character, by Virtue (pp. 12), describes the tax and nontax revenues, equity in taxation, and the behavior of taxes; (3) The Revenue System—the Federal Revenues, by Virtue (pp. 11), describes the tax and nontax revenues for 1931, the evolution of the Federal system, and the present system; (4) The Revenue System—State Revenues, with Special Reference to Nebraska, by Virtue (pp. 22), deals with the tax and nontax revenues and the principal State and local taxes; (5) The General Property Tax, by R. H. Cole (pp. 15), discusses the general property tax and its administration, pointing out some of the defects and suggesting some reforms; (6) Taxation of Intangible Property, by Virtue (pp. 20), discusses the theory and practical operation of the intangible property tax in the several States of the United States, the Nebraska law, and why it has not fulfilled expectations, and suggests possible improvements in the law; (7) Exemptions, by Virtue (pp. 22), describes the nature and purpose of exemptions and the exemptions for public property and tangible and intangible private property; (8) The Sales Tax, by H. Hedges (pp. 11), discusses the kinds of sales taxes, such taxes in use, the economic and social effects, the administrative aspects, and the place of sales taxes in a tax system; (9) The Income Tax, by H. C. Filley (pp. 19), describes the kinds of income taxes, the income taxes of European countries, the Federal Government, and the several States, and discusses the costs of administration and the advantages and disadvantages of such taxes; (10) The Taxation of Corporations (pp. 15) includes an article by E. G. Callen on the franchise tax, one by E. B. Schmidt on the corporate excess tax, and one by Virtue on the banks; (11) The Relative Tax Burden, by R. J. W. Ely (pp. 21), discusses the problems of measurement of the tax burden, bases of computing tax ratios, and the burden of taxes in the United States, sections of the United States, and Nebraska on farm real estate, city real estate, railroads, telephone companies, commercial banks, and insurance companies; and (12) Tax Administration in Nebraska, by Callen (pp. 10), describes the machinery of assessment and its defects and makes suggestions for improvements.

Variation in local marketing procedure for grain, hay, livestock, and feed in northwestern Indiana, L. ROBERTSON and E. R. BONHAM (*Indiana*

Sta. Bul. 364 (1932), pp. 20, figs. 18).—Analysis is made of data obtained in 1929 from all agencies in the 12 northwestern counties of the State (a section in which there has been rapid industrial development in nearby cities) handling grain, hay, livestock, meats, or feeds. The data covered number, kind, and location of the marketing agencies; amount of each kind of produce handled from May 1928 to April 1929; proportion of products shipped out and sold locally; destination of products shipped out; and method of transportation, prices to farmers, etc.

The marketing procedure and problems varied greatly between the 9 agricultural regions of the section studied, the principal causes being differences in the prevailing types of farming and in location. The changes taking place in farm production and marketing have been more rapid in the area studied than in any other large section of the State.

Among the changes found were (1) a greater increase in the use of trucks with an accompanying decrease in the need for local marketing agencies and variation in prices of the same product in different sections; (2) smaller grain sales through local agencies; (3) smaller production of hay, smaller demand for timothy, and an increased outlet for legumes; (4) smaller marketing of hogs and beef cattle and less local killing of livestock; (5) an increase in dairy and poultry production and in nonfarming rural population; (6) increased demand for sacked feed, particularly in grain-deficit areas; (7) greater variation between depression and boom periods in the demand for farm products and the costs of marketing them than in sections farther out in the State; and (8) a tendency for permanent changes in market procedure to be more rapid than in sections less influenced by industrial growth.

The marketing of milk thru ice cream, M. C. BOND (*New York Cornell Sta. Bul. 546 (1932), pp. 88, figs. 26).*—The study deals with milk products used in ice cream plants in the State located outside New York City and with the daily sales of ice cream in Buffalo, N.Y. Practically all of the milk and skim milk and most of the condensed milk used was produced in New York State. About 80 percent of the cream came from New York and the rest came from Illinois. The powdered skim milk used came from New York (30 percent), the Central States (31 percent), and California (39 percent). Most of the butter used came from the Central States.

The manufacture of butter and cheese in New York State has declined greatly in recent years, while the production of ice cream has increased rapidly. Ice cream manufacture in the State has an important bearing upon the consumption of milk because ice cream is sold mainly during the months of surplus milk supply. This makes an outlet for a considerable supply of milk which would otherwise have to be used in other manufactured products which would bring lower returns.

The per capita consumption of ice cream in the United States, which was estimated at 1.4 gal. in 1910, had increased to 3 gal. in 1929. During the period 1920 to 1928, inclusive, ice cream production in the United States increased 29 percent, while in New York the increase was 90 percent, or about 3 times as rapid.

In 1925 and 1926, the average prices received by farmers for the whole-milk equivalent of all milk fat used in ice cream by the plants studied were about the same as the prices quoted for class 2 milk by the Dairymen's League Cooperative Association. The cost of milk products per gallon of ice cream decreased with the increase in the size of the plant. The lowest costs were found in plants using miscellaneous products including butter and powdered skim milk and the highest costs in plants purchasing ice cream mix exclusively.

Seasonal variations of ice cream sales in New York were slightly greater than for the United States. The efforts of manufacturers to increase winter sales resulted in only slight improvement in recent years. Sales are affected by temperatures. Changes above 40° F. have more effect than changes below 40°, and changes above 70° have the greatest effect on sales.

In addition to 68 tables in the text, 29 tables are presented in the appendix.

Cream grading on the four day delivery plan in Indiana, V. C. MANHART (*Indiana Sta. Circ. 193* (1932), pp. 20, figs. 5).—This circular describes the various phases of the operation of the 4-day delivery plan of cream grading and gives some data as to the results of its use in Indiana from 1927 to 1932, inclusive. The plan provides for four grades of cream as follows: Premium, sold at intervals of not more than four days and free from undesirable flavors and odors at the time of delivery; regular, sold at intervals of more than four days, and that sold at intervals of four days or less which contains undesirable flavors and odors but is not of such quality as to warrant placing it in the onion or rejected grade; onion cream, containing onion or garlic flavor; and rejected cream, which is rancid, moldy, dirty, oily, or otherwise unwholesome.

The percentage of cream marketed at intervals of four days or less increased from less than 20 percent in 1927 to 75.6 percent in 1932. Over a third of a million dollars in premiums was paid to farmers during the five years as a result of a 4-day grading plan. The plan has established a uniform system of buying on a grade basis with a tangible standard that cannot be misconstrued or misunderstood. It has improved the quality of cream delivered, thus making possible the manufacture of a good grade of butter and the payment of a higher price for butterfat. Investigations at the station showed that butter churned from premium cream scored about 1.25 points higher than that made from regular cream.

Operation and management of milk plants, C. E. CLEMENT (*U.S. Dept. Agr. Circ. 260* (1933), pp. 51, figs. 8).—This circular, which supersedes the bulletin previously noted (*E.S.R.*, 49, p. 377), "gives basic information on the methods of operating milk plants which have proved to be satisfactory in practice, and discusses certain phases of management which are directly related to successful operation." The systems used in buying milk, receiving and pasteurizing milk, the operation of the pasteurizing and cooling equipment, bottling and capping, washing cans, milk-plant sanitation, bottle losses, goods returned, disposal of surplus milk, shrinkage in handling milk at plants, checking milk through the plant, and the number of men required to operate plants of different sizes and deliver milk are discussed.

Price spreads and restraint of United States wheat exports, A. E. TAYLOR ET AL. (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 9* (1932), No. 1, pp. [2]+22).—This is another of the series of studies of the world wheat situation in relation to national economy. The discussion comprises the European import trade, technic of wheat exporting, distressed wheat, pertinent statistics for 1931-32, why prices were above export parity, how commercial exports were possible, and concluding observations.

The United States, with an exportable surplus of record size, exported relatively little wheat and flour in 1931-32. Export business was sought by the Grain Stabilization Corporation, the private trade, and the cooperatives, but wheat prices here, though disastrously low, were too high to permit liberal commercial exports. Importing countries got their import supplies cheaper elsewhere.

The authors discuss the forces that are responsible for keeping United States wheat prices above the export basis in a period when our exportable surplus

is very large. The conditions permitting exports frequently to move out with Chicago futures above export parity with Liverpool prices are examined in considerable detail.

The authors conclude that in the absence of the Federal Farm Board support to the wheat market in 1929-31 other forces such as operated in 1931-32 would have limited the decline of domestic wheat prices, restrained exports, and enlarged the carry-over. The authors also explain that their analysis of the situation is tentative in character, and that no attempt has been made to weight the several factors involved.

Barter and scrip in the United States: Selected references (*U.S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog.* 40 (1933), pp. 43).—This is a mimeographed bibliography containing 252 selected references mainly on the use of barter and scrip in the United States including its use by chambers of commerce, municipalities, and self-help and emergency cooperative exchanges for the relief of unemployment. A few references on the history of barter and scrip are also included.

Crops and Markets, [February 1933] (*U.S. Dept. Agr., Crops and Markets*, 10 (1933), No. 2, pp. 33-80, figs. 3).—Included, besides the market reports for livestock and livestock products, dairy and poultry products, cold storage holdings, grain, hay, feed, seeds, fruits and vegetables, and cotton, and the summary of the price situation, are a summation of the agricultural outlook report for 1933 and the crop and livestock estimates for 1933, which include tables showing, by States, for 1931, 1932, and 1933 the number, farm value per head, and total farm value of horses and colts, mules and colts, milk cows and heifers, all cattle and calves, sheep and lambs, and swine on farms January 1; estimated prices of different farm products, January 15, 1932 and 1933; hog and corn ratios, by months, 1930-32; farm labor supply and demand, January 1, 1932 and 1933; average wages paid hired farm labor, January 1931, 1932, and 1933; estimated commercial acreage of specified truck crops, by years 1928-33; and the production of beans by commercial classes, by years 1929-32. Other tables show the monthly farm prices of different kinds of livestock and livestock products for periods of years, and other data as to farm prices, farm wages, hog-corn ratios, etc.

RURAL SOCIOLOGY

[Investigations in rural sociology of the Ohio Station] (*Ohio Sta. Bul.* 516 (1933), pp. 97, 98).—Findings are briefly noted as to the movement of open-country population in Ohio, by P. G. Beck, and on the growth cycle of the farm family, by C. E. Lively.

The Yankee community in rural New England, H. C. WOODWORTH (In *New England's Prospect*, 1933. *Amer. Geogr. Soc. Spec. Pub.* 16 (1933), pp. 178-188).—The author discusses the decadence and growth of rural New England communities and cites examples. In some communities agriculture has advanced, while in others it has waned. Forces influencing the growth of these communities discussed are psychological factors, differences of personnel within the community, family tradition as a tie to the soil, and farm abandonment.

The supreme effort is to keep the communities which remain in sound, healthy, and prosperous condition.

Recent immigrant stocks in New England agriculture, J. L. HYPES (In *New England's Prospect*, 1933. *Amer. Geogr. Soc. Spec. Pub.* 16 (1933), pp. 189-205, figs. 3).—The author found that an immigrant tide has flowed into

the farming communities as well as the mill towns of New England. More than a third of all the farm folk of New England are of foreign stock. This gives the section a higher proportion of foreign born in the rural population than any other section of the country except the Pacific coast.

Immigrants are further discussed from the viewpoints of types of farming, soil types, standards of labor, social conflict, the purchase of farms, social participation, socialization and education.

In conclusion, some 12 different types of needed social researches are listed.

Population trends in New York State, 1900 to 1930, W. A. ANDERSON (*New York Cornell Sta. Bul.* 547 (1932), pp. 60, figs. 16).—Changes occurring in number and proportions of the classes of population of New York State from 1900 to 1930 are pointed out. Census definitions are followed. During this period New York State population increased steadily and at a higher rate than that of the United States. Rural population decreased absolutely and relatively from 1900 to 1920, but increased from 1920 to 1930. Farm population decreased from 1900 to 1930, continuing the migration from farms begun about 1880. An increase in the rural-nonfarm population accounts for the increase in total rural population of the State. The suburbanization process was speeded up between 1920 and 1930 by automobiles, good roads, cheapness of rural lands, and advantages of living in open country.

Accompanying the decrease in farm population was a decrease in percentage of land in farms and number of farms. Much land, abandoned for farming purposes, was absorbed by suburban developments.

An appendix carries 25 tables in addition to those accompanying the text.

The qualitative nature of rural depopulation in Santuc Township, South Carolina, 1900–1930, W. GEE (*South Carolina Sta. Bul.* 287 (1933), pp. 22, figs. 7).—The author analyzes the rural migration of his native township for the period from 1900 to 1930. Prior to about 30 years ago, Union County, in which the area is located, was almost entirely agricultural but since has shared in considerable measure in the industrial development of the South.

The population of Santuc Township declined from 2,844, consisting of 695 whites and 2,149 negroes, in 1900 to 1,893, consisting of 571 whites and 1,322 negroes, in 1930.

By a process, somewhat intuitive and involving social and economic considerations with family tradition and community worth as essential elements, the white population of 1900 and again of 1930 was classified in upper, middle, and lower classes. What happened to each individual there in 1900 and where those who were there in 1930 but not there in 1900 came from were determined.

The upper class is predominantly the landowning class, with larger farms and families, on the average, in 1900 than in 1930. The middle class, to the extent of nearly half of them, own farms on the average somewhat more than half the size of the upper group and property assessed at considerably less than half the value. The lower class is largely a nonlandowning group and even under normal conditions would be classified as submarginal farmers.

Between 1900 and 1930 the number in the upper class declined from 250 to 160, or a percentage decline of 36; the middle class, on the contrary, increased from 314 to 361, or a percentage increase of 15; and the lower class declined from 131 to 50, or 61.8 percent. The author found in 1930 a depletion of the original stock in the upper class amounting to 50.8 percent, in the middle class 49.4 percent, and in the lower class 80.9 percent.

Of the severe depletion in the upper class, a considerable portion was occasioned by migration to cities, adjacent and distant. The loss must undesirably lower the levels of life in the rural section affected, although the

increase in the middle class, through immigration into the area, may eventually repair the loss. Industrial development in the Piedmont, of which Union County is a part, has drawn most heavily upon the lower class. The negro population of the township, which in 1900 amounted to nearly 76 percent of the population, had been reduced by 1930 to approximately 70 percent by cityward migrations. The number of negroes had been reduced from 2,149 in 1900 to 1,322 in 1930.

The conclusions are reached that while the township has suffered severely in both the absolute and proportionate loss of its best people, it has been compensated by negro emigration and white accretions to the middle and upper classes which tend to preserve and continue wholesome functioning of its population.

A reclassification of urban-rural population, T. J. WOOFER, JR., and E. WEBB (*Social Forces*, 11 (1933), No. 3, pp. 348-351, fig. 1).—The usual and the new classifications of the United States census are compared.

Farm trade centers in Louisiana, 1901 to 1931, T. L. SMITH (*Louisiana Stas. Bul.* 234 (1933), pp. 56 figs. 3).—Comparisons between 1901 and 1931 disclose fundamental changes under way in the social organization of the State. An increasing proportion of social activities is being organized around the larger trade centers. Small trade centers are losing in importance. Some are developing into larger centers, while others are being smothered out. However, small trade centers that supplement or complement larger centers are maintaining themselves.

The changes noted are widening the area of social contacts and reducing the social differences found to exist among the various community groups. A tendency toward division of labor between trade centers of different sizes was found.

The process of urbanization and industrialization is under way, and being less advanced than in other sections of the United States will continue for some time. Changes in the rice-farming area are more pronounced than in other parts of the State.

A decrease of familism was indicated. Contacts with the kinship group will become less and with other groups more frequent. Local ties will be weakened and those with special interest groups strengthened.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Producing farm livestock, J. L. EDMONDS, W. E. CARROLL, W. G. KAMMLADE, W. B. NEVENS, and R. R. SNAPP (*New York: John Wiley & Sons; London: Chapman & Hall*, 1932, pp. XIII+439, pl. 1, figs. 111).—This textbook presents the subject matter on the operative basis, i.e., in the form of the actual procedures, step by step, as taken up in practical livestock production. The several chapters deal with the establishing and organizing of dairy cattle, beef cattle, horse, sheep, and swine enterprises, the feeding and management of each kind of livestock, and marketing, improving, and exhibiting livestock.

Each chapter is followed by questions for farm or community studies and a list of selected references.

Organization and teaching procedure to be followed in evening agricultural schools on the marketing of poultry products (*Fed. Bd. Vocat. Ed. Monog.* 17 (1932), pp. III+40).—This publication was prepared by J. H. Pearson in cooperation with J. J. Scanlan of the Federal Farm Board. Analysis of the job of marketing poultry products is made, showing the decisions to be made, factors to be considered, and information needed to apply factors, and suggestions are included on teaching procedure for each factor.

Suggestions for studies and research in home-economics education (*Fed. Bd. Vocat. Ed. Bul.* 166 (1932), pp. XI+77).—This bulletin, prepared by B. I. Coon in collaboration with C. M. Brown and R. M. Friant, outlines projects needing investigation and some basic considerations in relation to each. The possibilities in research and in home economics education, the factors to be considered in such research, and the responsibilities of institutions in giving training in such research are discussed. A partial outline of the fields of investigation and research is presented and discussed, and suggestions are made for its use.

A bibliography including references on educational research and studies and research in home economics education and abstracts of theses in home economics education completed during the year 1930-31 are given.

The teaching of science related to the home, E. P. AMIDON and H. B. McKIBBEN (*Fed. Bd. Vocat. Ed. Bul.* 158 (1931), pp. VII+127, figs. 12).—This bulletin presents suggestions for content and method in related science instruction in the vocational program in home economics. It discusses the need for science training and the problems involved in training teachers and including science in a vocational program in home making, work done and progress made in related science teaching in the vocational home-making departments, the objectives for a course in science related to the home, and the factors influencing selection of content and the sequence. Suggestions are made for methods of teaching and reference material and experiments, for the evaluation of results of teaching, and for the use and storage of equipment and supplies.

Appendixes include plans for including related science in the vocational home-making programs, extracts from a previous publication of the Board on Suggestions for Content and Methods for a Course in Science Related to the Home, a list of studies made and materials recently issued by States on the teaching of science related to the home, and an illustrative teaching plan for the development of a specific ability.

Workers in subjects pertaining to agriculture in State agricultural colleges and experiment stations, 1932-1933, M. A. AGNEW (*U.S. Dept. Agr., Misc. Pub.* 154 (1933), pp. IV+133).—This is the usual annual list (E.S.R., 67, p. 85) showing the workers in agriculture and home economics in the State and territorial colleges and stations, by departments, and other data.

FOODS—HUMAN NUTRITION

Practical physiological chemistry, P. B. HAWK and O. BERGEIM (*Philadelphia: P. Blakiston's Son & Co., 1931, 10. ed., rewritten, pp. XVIII+929, pls. 8, figs. 280*).—The tenth edition of this well-known volume (E.S.R., 57, p. 291) marks the twenty-fifth anniversary of the first edition.

Nutrition laboratory, F. G. BENEDICT (*Carnegie Inst. Wash. Yearbooks*, 29 (1929-30), pp. 183-196; 30 (1930-31), pp. 223-238; 31 (1931-32), pp. 173-182).—The pages noted cover the annual progress reports since 1928-29 (E.S.R., 63, p. 288). Most of the studies have been noted from other sources.

Nutritive value of cranberries, C. R. FELLERS (*Amer. Jour. Pub. Health*, 23 (1933), No. 1, pp. 13-18).—This report summarizes data, some of which have been noted from progress reports from the Massachusetts Experiment Station (E.S.R., 67, p. 473), on the proximate composition of cranberries, the effect of ingestion of cranberries on the content of hippuric acid in the urine and the blood plasma alkali reserve, and the nutritive properties of cranberry sauce (method of preparation not stated).

The benzoic acid content of fresh cranberries was found to vary from 0.035 to 0.095 percent and that of quinic acid from 0.6 to 0.9 percent. The conju-

gation of these acids produces urinary acidity in proportion to the quantity of cranberries ingested, but servings of 5 oz. or less of cranberry sauce produced little change in either the pH or hippuric acid value of the urine. The alkali reserve of the blood showed no decrease until more than 5 oz. of cranberry sauce had been eaten, but larger amounts brought about a considerable decrease in alkalinity.

Data are also reported on the vitamin C content of different varieties of cranberries and of cranberry products. From 3 to 4 g of fresh cranberries sufficed to maintain normal growth and afford complete protection against scurvy in 300-g guinea pigs. The vitamin C content was not affected by freezing and subsequent storage at 0° F. for 9 months and only slightly affected by storage at 40° for 3 months. Alternate freezing and thawing proved very destructive. Fresh cranberry juice was quite as potent as the original fruit, but juice bottled by present commercial methods was practically devoid of vitamin C. Whole fruit sauce contained approximately 80 percent and strained sauce less than 10 percent of the original vitamin C content. Evaporated whole cranberries were devoid of vitamin C, but a quick-dried powder retained over 50 percent.

Vitamins B and D could not be detected, and vitamin G was present in traces only. Vitamin A was present in small but measurable quantity, 1.2 units per gram.

[**Fruit products**] (*California Sta. Rpt. 1932, pp. 29, 30*).—This progress report (E.S.R., 67, p. 622) deals briefly with tests of various canned and dried fruits for maintaining the alkaline reserves in the body, comparisons of quick freezing and slow freezing methods for the preservation of fruits and vegetables, chemical changes in fruits and methods of preserving orange juice in frozen storage, and methods for shipping fresh fruits overseas.

The sterilization of fruit juice with heat developed by the resistance of the juice to the passage of an alternating electric current, L. J. PEET and L. E. SATER (*Iowa Sta. Rpt. 1932, p. 95*).—Observations are reported on the appearance and sterility after nine months' storage of tomato, grape, and apple juices sterilized in the apparatus described previously (E.S.R., 67, p. 493).

Studies in home canning methods (*Indiana Sta. Rpt. 1932, pp. 44, 45*).—This progress report (E.S.R., 67, p. 637) includes further data on the comparative rate of heat penetration in oven, waterless cooker, and water bath processing, using peaches as the test food, and observations on the keeping quality of tomatoes processed in the oven for varying lengths of time.

Foods of ancient Hawaiians, C. D. MILLER (*Mid-Pacific Mag., 44 (1932), No. 4, pp. 337-342, figs. 4*).—A popular article based upon the author's studies on the nutritive value of some of the more important foods known to have been included in the diet of early Hawaiians (E.S.R., 67, p. 473).

Nutrition for superior growth, I. N. KUGELMASS (*Arch. Ped., 49 (1932), No. 11, pp. 713-729*).—In the author's opinion, "lack of supervision of the nutritional status of growing children and adolescents has actually been conducive to retrograde results in comparison with their nutritional course in infancy. These failures in child nutrition are undoubtedly due to the fact that a typical American dietary nonconductive to growth and development is foisted upon children dining with adults." With this in mind, the nutritive requirements of children as contrasted with adults are discussed with respect to energy, carbohydrate, fat, minerals, and vitamins.

A study of the food habits and physical development of pre-school children over a two-year period with special reference to seasonal variations in growth, H. MCKAY and M. B. PATTON (*Ohio Sta. Bul. 516 (1933), pp.*

91-94).—In this progress report, data obtained in a weighed dietary study by the individual method of a small group of children for periods of seven consecutive days each during January, March, June, and October are summarized and discussed with reference to seasonal differences.

White House Conference on Child Health and Protection: Sect. I, Medical Service.—Growth and development of the child: Part III, Nutrition (*New York and London: Century Co., 1932, pp. XX+532, figs. 14*).—Following the general introduction by K. D. Blackfan, which appears in each of the four volumes comprising the complete report of the committee on growth and development of the White House Conference on Child Health and Protection, this volume consists of brief sections, most of which are followed by lists of literature references, on present-day knowledge concerning the following topics: Optimal growth and nutrition; appraisal of the national food supply; appraisal of food analysis; the relation of the amino acids to nutrition and growth; the protein requirements of infants and children; the metabolism of the sugars; the requirements of infants and children for carbohydrate; the phospholipids and sterols; fat as a constituent of the diet; vitamin A; the vitamin B complex; vitamin C; vitamin D; vitamin E; the pathology of vitamin deficiencies; minerals—common elements; iron in nutrition; iodine in nutrition; the significance in nutrition of physiologically rare elements; water; factors governing the energy requirements of children; the energy requirements of children in infancy; the energy requirements of children after infancy; human milk and artificial feeding; growth and health in relation to nutrition; the choice of foods; dietary adaptations for geographic and racial factors; the effect of cooking and preserving processes on the nutritive value of food; coffee, tea, and cocoa for children; feeding habits in children; and psychological factors in nutrition.

Continuation and extension of work on vegetable proteins, L. B. MENDEL and H. B. VICKERY (*Carnegie Inst. Wash. Yearbooks, 29 (1929-30), pp. 380-389; 30 (1930-31), pp. 430-441; 31 (1931-32), pp. 314-321*).—The pages noted cover the annual progress reports (*E.S.R.*, 63, p. 392) for the years 1929-30, 1930-31, and 1931-32. Most of the studies have been noted previously from other sources.

The protein requirements of the albino mouse, F. C. BING, W. L. ADAMS, and R. O. BOWMAN (*Jour. Nutrition, 5 (1932), No. 6, pp. 571-579, fig. 1*).—Studies are reported leading to the conclusion that, "contrary to what has been believed, the protein requirements of the mouse are certainly fulfilled by diets containing 15.6 percent casein, and probably somewhat less would also be satisfactory. These are about the same as the requirements of the rat, the differences due to metabolic rates becoming apparent when the gain in weight per gram of ingested protein is measured."

The relation of the dicarboxylic amino acids to nutrition, R. R. ST. JULIAN and W. C. ROSE (*Jour. Biol. Chem., 98 (1932), No. 2, pp. 439-443, fig. 1*).—In this reinvestigation of the relation of the dicarboxylic amino acids to growth (*E.S.R.*, 58, p. 892), the removal of aspartic, glutamic, and hydroxyglutamic acids from hydrolyzed casein was found to have no effect upon the nutritive value of the resulting material. This is thought to indicate that the dicarboxylic amino acids are not indispensable dietary components.

Proline and hydroxyproline in nutrition, R. R. ST. JULIAN and W. C. ROSE (*Jour. Biol. Chem., 98 (1932), No. 2, pp. 445-455, figs. 3*).—In this attempt to answer the disputed question as to the indispensability of the amino acids proline and hydroxyproline in nutrition, the dry mixture of amino acids obtained by acid hydrolysis of casein, lactalbumin, and edestin was subjected to 40 ex-

tractions each with absolute ethyl alcohol and then fed to rats at a 9 percent level (including suitable amino acid substances). The supplements were tryptophane and cystine for the extracted casein and lactalbumin, and tryptophane, cystine, and lysine for the extracted edestin.

Growth at moderately rapid rates resulted in each case and was not increased by the administration of 50 mg of proline daily. The supplementing effect of hydroxyproline was not tested.

The authors conclude that proline is a dispensable amino acid. In view of uncertainty as to the completeness of removal of hydroxyproline, no positive statement is made concerning its dispensability.

The possible interchangeability in nutrition of certain 5-carbon amino acids, R. R. ST. JULIAN and W. C. ROSE (*Jour. Biol. Chem.*, 98 (1932), No. 2, pp. 457-463, fig. 1).—In view of the evidence reported in the two papers noted above pointing to the dispensable nature of the glutamic acids, proline, and possibly hydroxyproline and previous findings from the same laboratory indicating the dispensable nature of arginine, the possibility that these amino acids might be interchangeable in the diet was tested by suitable feeding experiments.

Arginine, the dibasic amino acids, and the prolines were removed from hydrolyzed casein, and the remaining amino acids, supplemented with tryptophane, cystine, and histidine, were fed at an 11.5 percent level as the sole source of nitrogen except for that present in 100 mg of yeast daily in otherwise adequate diets. Although the rats receiving these food mixtures grew at only about half the normal rate, the incorporation of suitable quantities of arginine, aspartic and glutamic acids, and proline did not improve the growth rate.

"The above results appear to indicate that the 5-carbon amino acids, ornithine, glutamic acid, hydroxyglutamic acid, proline, and hydroxyproline, are not capable of playing an interchangeable role in nutrition. However, final judgment must await the results of feeding experiments involving the use of mixtures of highly purified amino acids known to be entirely devoid of the compounds in question."

The metabolism of cystine and methionine: The availability of methionine in supplementing a diet deficient in cystine, R. W. JACKSON and R. J. BLOCK (*Jour. Biol. Chem.*, 98 (1932), No. 2, pp. 465-477, figs. 4).—Evidence is presented leading to the conclusion that methionine, the sulfur-containing amino acid discovered by Mueller (*E.S.R.*, 51, p. 109), is capable of stimulating growth in white rats on a diet deficient in cystine. Various other amino acids, including serine and alanine, were ineffective. The restriction of the food intake to a constant amount throughout the experiment, as described in a previous paper (*E.S.R.*, 62, p. 790), did not prevent growth acceleration by the methionine.

Various interpretations of the supplemental effect of methionine are proposed and discussed, with the conclusion that "further study is necessary to permit a precise interpretation of the facts at hand."

Factors in food influencing hemoglobin regeneration.—II, Liver in comparison with whole wheat and prepared bran, M. S. ROSE and L. KUNG (*Jour. Biol. Chem.*, 98 (1932), No. 2, pp. 417-437, figs. 2).—In connection with the first study of the series (*E.S.R.*, 68, p. 412), the observation was made that the amount of hemoglobin regenerated in rats on feeding 1 g of beef liver daily was less than that from 1.5 g of whole wheat furnishing approximately the same amount of iron, 0.05 mg. To determine whether or not the apparently poorer utilization of the iron from the liver was due to storage in some form other than hemoglobin, young rats from mothers on a normal diet were fed

milk exclusively until their hemoglobin dropped below 7 g per 100 cc of blood and were then put on diets known to be adequate to restore hemoglobin to a normal level (16 g per 100 cc of blood) in 6 weeks. Four of the diets consisted of milk supplemented daily by (1) 6.5 g of whole wheat, (2) 1.8 g of prepared bran, (3) 1.6 g dried liver, and (4) 3.6 g prepared bran. The first two furnished 0.2 mg and the others 0.4 mg of iron daily. The fifth diet was a modified Osborne and Mendel diet furnishing 0.38 mg of iron daily. Normal hemoglobin levels were reached on diet 4 in 3 weeks and on the others in 5 or 6 weeks. Growth was greatest on the diet containing liver and the modified Osborne and Mendel diet, next on the whole wheat, and least on the bran.

At the end of the 6 weeks' feeding period the animals were all depleted by milk feeding and repeated bleeding from the heart until the hemoglobin was reduced to an average of about 6 g per 100 cc of blood, at which point the animals were all killed and their bodies analyzed for iron. From hemoglobin determinations at the beginning and end of the bleeding period, the extent of hemoglobin removal was determined.

"It was found that differences between sexes were marked, females per unit of weight yielding more hemoglobin than males, and thus indicating greater capacity for storage. Taking hemoglobin withdrawn from the animals on 0.2 mg of iron in the form of whole wheat as the basis for comparison, those on 1.8 g of bran grew less well and produced slightly less hemoglobin, those on 0.4 mg of iron as liver grew slightly better but produced no more hemoglobin. Animals on 0.4 mg of iron as bran produced slightly more than those on 0.2 g of whole wheat, indicating that 0.2 mg of iron is slightly below the optimum daily amount for the rat. Experience with other diets yielding more than the minimum requirement of iron in readily available form . . . indicates that iron furnished in amounts above this optimum for maintenance of normal hemoglobin is not held in reserve."

There was a striking constancy in the iron content of the bodies of the rats at the end of the bleeding period regardless of sex or diet. The content of iron in 78 bodies averaged 0.0021 ± 0.00003 percent.

The effects of yeast ingestion on the composition of the urine and feces, H. B. PIERCE (*Jour. Biol. Chem.*, 98 (1932), No. 2, pp. 509-535).—This extensive investigation, in which the author had the assistance of D. D. Posson, V. du Vigneaud, C. A. Morrison, Z. du Vigneaud, and M. S. Pierce, had two objectives: (1) To determine the changes in the chemical composition of the urine and feces as a result of the ingestion of bakers' yeast and the relation of these changes to intestinal putrefaction, and (2) to determine whether yeast used under controlled conditions has a laxative action, this being interpreted as "an easier or more complete evacuation of the lower bowel." The subjects were four healthy adults who were engaged in laboratory work during the course of the experiment. Three different diets were used, one of them for a preliminary study on a single subject and the other two for the main experiment with all four subjects. Of these, diet 2 contained somewhat more protein and diet 3 more carbohydrate than was usually present in the dietary of the subjects. The yeast was taken raw by all subjects, 1 or 2 cakes being taken before each meal. The conclusions drawn concerning the laxative action of the yeast were as follows:

"Judged by the number of stools, by the weight and bulk of the stools, and by the ease of evacuation, live yeast had a laxative effect. The results were more marked in the first yeast period than in the second. The effect extended over into the following control period frequently. The action was more marked

on a carbohydrate-rich than on a protein-rich diet. The moisture content of the feces as a general rule decreased during yeast periods, only constipated subjects showing an increase in the percentage of water."

There was a greater elimination of phenol, indican, and indole during the yeast than the control periods. Several possible explanations of this are suggested. The phenol content of the urine suggested that yeast caused diminution in putrefaction. The increases in indican and indole were not as great as would be expected if the yeast tryptophane had been subjected to the same degree of putrefaction as that of the protein of the control diet. The elimination of inorganic sulfates decreased and of ethereal sulfates increased during the yeast periods. The latter was not materially influenced by the type of diet, suggesting that it was of endogenous origin.

The titratable acidity of the urine fell during the yeast periods. There was a greater elimination of urinary ammonia in the majority of the average trials and a marked increase in fecal ammonia in every trial. It is thought that the extra ammonia formed during the yeast periods was for the purpose of neutralizing extra acid and conserving the fixed base in the body. The volatile acid excretion in the feces increased during the yeast periods, particularly on the carbohydrate diet. All of the subjects were in positive nitrogen balance during the yeast periods, and in some of the trials the nitrogen retained was more than equivalent to that contained in the yeast. The results were variable in the uric acid excretion, which showed no relationship to urinary nitrogen. This is thought to indicate that the individual subjects possessed varying capacities to metabolize nucleoproteins. "From the results obtained, it does not seem probable that yeast, at least in the quantities consumed in this investigation, would cause an increase in uric acid production sufficiently great to exert a harmful effect on the organism."

The effect of the calcium-phosphorus relationship on growth, calcification, and blood composition of the rat, R. M. BETHKE, C. H. KICK, and W. WILDER (*Jour. Biol. Chem.*, 98 (1932), No. 2, pp. 389-403).—In this investigation at the Ohio Experiment Station, data were obtained on the growth, ash content of the femurs, calcification of the ulnae and radii, and phosphorus and calcium content of the blood serum of rats on diets varying in their absolute and relative content of calcium and phosphorus with and without vitamin D.

"The data in general show conclusively that in the absence of vitamin D the proportion of calcium to phosphorus in the ration, within certain limits, exerts a marked effect upon growth, bone formation, and the percentages of these elements in the blood. Although the concentration or the levels at which calcium and phosphorus were present in the ration had some beneficial effect on growth and bone formation, this effect was not as great as that exerted by the actual proportion between the elements. The inclusion of vitamin D not only tended to stabilize the calcium and inorganic phosphorus concentrations in the blood serum, but made a greater percentage of these elements available for such biological phenomena as calcification and growth. Evidence is also presented showing that the wider the Ca:P ratio the greater are the requirements for vitamin D. With the same amount of irradiated ergosterol, a ration possessing a Ca:P ratio of 5 produced bones from 6 to 7 percent lower in ash than did a similar ration with a Ca:P ratio falling between 2 and 0.5."

Attention is called to the importance of taking these facts into consideration in attempts to evaluate foods or rations for their calcifying properties and for their content of vitamin D. It is emphasized that a distinction should be made between calcification studies to determine the "over-all" effect (the combined effect of inorganic elements and vitamin D) of a foodstuff and its inherent vitamin D potency. "The actual vitamin D content of a food can

only be determined when other inherent factors, such as calcium and phosphorus, are corrected for."

Bibliography on heavy metals in food and biological material.—I, Copper, compiled by T. H. POPE (*Analyst*, 57 (1932), No. 680, pp. 709-714).—An extensive list of annotated references from 1921 to date.

The heat production of unusually large rats during prolonged fasting, F. G. BENEDICT, K. HORST, and L. B. MENDEL (*Jour. Nutrition*, 5 (1932), No. 6, pp. 581-597).—In this extension of the investigation noted previously (E.S.R., 65, p. 98) to metabolism determinations during prolonged fasting on two unusually large rats (initial weights at the beginning of the experiments 822 and 730 g) and to basal metabolism measurements on a number of other full grown rats, some medium in size (307 to 396 g) and others large (407 to 562 g), it was found that the larger the rat the lower the basal metabolism per unit of weight and unit of surface area. "With one of the large rats minimum values of 377 and 381 calories per square meter of body surface per 24 hours were recorded on the twenty-ninth and forty-third days of fasting. This is probably the lowest heat production that has been noted with warm-blooded animals having a rectal temperature of essentially 37° C."

Physiological functions of vitamins, R. R. WILLIAMS and W. H. EDDY (*Carnegie Inst. Wash. Yearbooks*, 29 (1929-30), pp. 389-395; 30 (1930-31), pp. 441-447; 31 (1931-32), pp. 321-325).—The pages noted cover three annual progress reports on the investigation noted previously (E.S.R., 63, p. 292). Progress during 1929-30 has been noted essentially in papers by Williams, Waterman, and Gurin (E.S.R., 62, p. 113) and Eddy, Gurin, and Keresztesy (E.S.R., 64, p. 294) for the B vitamins, and Dalldorf and Zall (E.S.R., 63, p. 696) for vitamin C.

The progress report for 1930-31 deals with further attempts to isolate vitamin B (B_1) in quantity from rice polishings, a reexamination of the effect of food consumption upon the requirement for vitamin B, a comparison of the relationship of the pathology of rat dermatitis to that of human pellagra (E.S.R., 66, p. 692), a study of the pathology of scurvy, as noted in a paper by Dalldorf (E.S.R., 66, p. 795), vitamin A technic, and the solarization of ultraviolet transmitting glass.

The report for 1931-32 is concerned with further attempts at isolating vitamin B from rice polishings and includes a brief summary of the results obtained by other investigators and a discussion of the difficulties involved in large scale extraction.

[Vitamin studies at the Iowa Station] (*Iowa Sta. Rpt. 1932*, pp. 48, 92-95).—Progress reports (E.S.R., 67, p. 473) are given on investigations dealing with the intestinal iron reduction test for vitamin D and attempts to synthesize vitamin D, by L. Yoder; improvements in the basal ration for vitamin A determinations and a statistical study of growth records of the stock colony of rats over a period of three years, by P. M. Nelson and P. P. Swanson; the effect of storage of canned tomatoes for one, two, and three years on the content of vitamin A, by Nelson, Swanson, and E. S. Haber; and the effect of varying fertilizer treatments on the vitamin A content of sweetpotatoes of the Prolific variety, by Swanson, Nelson, and Haber.

Recent knowledge of vitamins A and D, D. L. TABERN (*Clin. Med. and Surg.*, 40 (1933), No. 1, pp. 9-12).—In this review of recent literature on vitamin D, particular emphasis is given to discrepancies in the effectiveness for infants (and also children) of doses of liver oils and of viosterol of the same number of rat units and to the necessity for caution "in proposing and utilizing concentrates and artificially prepared vitamin A and D solutions other than

viosterol until there is ample evidence of their clinical efficiency in the human organism."

The selected references on vitamin A deal chiefly with the treatment of various pathological conditions involving mucous membranes with vitamin A and vitamin A reserves in the body.

The effects of vitamins A and D on antibody production and resistance to infection, M. R. GREENE (*Amer. Jour. Hyg.*, 17 (1933), No. 1, pp. 60-101).—This contribution to the extensive and conflicting literature on the subject reports an investigation of the "related cellular and humoral changes in the blood and other body fluids, with consequent variations in the kinds and amounts of natural and immune antibodies" as possible predisposing factors to infection in vitamin deficiency. Rabbits were selected as the experimental animal, and deficiencies in vitamins A and D were studied with respect to their effect on tissue antigen (sheep and ox red corpuscles) and a bacterial antigen (*Bacillus typhosus*). Physiological changes in the vitamin deficient animals, changes in the bacteriology of the upper respiratory tract, and the resistance to infection with various organisms were also studied.

Contrary to previous findings of Werkman (*E.S.R.*, 49, p. 279), a marked lack of response to immunization with sheep red blood corpuscles was observed in the vitamin A-deficient animals. This was not true of the vitamin D-deficient animals. No change in complement or in erythrocyte counts occurred in either deficiency. These findings are in harmony with evidence reported by other investigators.

Leucocytosis was observed in the A-deficient but not in the D-deficient animals. These results are in harmony for vitamin A with observations of Turner and Loew (*E.S.R.*, 66, p. 196) on rats and with those of Sure et al. (*E.S.R.*, 66, p. 198) for vitamin D, but contrary to the latter for vitamin A.

A lowering of body temperature in the vitamin A-deficient animals occurred only shortly before death, and not progressively during the depletion period as noted by Werkman. Both the vitamin A- and vitamin D-deficient animals appeared to have a definitely increased susceptibility to inoculation with pneumococcus and *Bacterium lepi-septicum*.

Vitamins aid reduction of lost time in industry, A. D. HOLMES, M. G. PIGOTT, W. A. SAWYER, and L. COMSTOCK (*Indus. and Engin. Chem.*, 24 (1932), No. 9, pp. 1058-1060).—In this attempt to determine if the use of cod-liver oil as a supplement to the usual home diet would be of economic value to an industry through raising the resistance of the workers to disabling colds and similar infections, 185 employees (115 women and 70 men) in a large industrial organization were given one tablespoonful of cod-liver oil daily during the morning or afternoon rest period for a 4-month period from December to March, inclusive, while a group of 128 (88 women and 40 men) served as controls. Records were kept of illnesses and absence from work in both groups. The ages of the subjects ranged from below 20 to above 45 years, with 87.6 percent between 21 and 45 years. The types of work represented were office 34, light machine work 27.6, and heavier machine work 38.4 percent.

During the period under observation, 55.1 percent of the cod-liver oil group and 32.8 percent of the control group developed no colds and 51.9 percent of the first and 40.6 of the second group lost no time from work. The average hours of absence for the two groups were 12.8 and 25.1, respectively, as compared with 20.4 and 17.4 for the same subjects during the corresponding period of the previous year when the diets were not supplemented.

"From these data it would appear that feeding a vitamin-rich material as a supplement to the home dietary materially reduced the economic loss to employer and employee occasioned by lost time of industrial workers."

Results of supplementing the dietary of substandard workers with cod liver oil and milk, A. D. HOLMES, M. G. PIGOTT, W. A. SAWYER, and L. COMSTOCK (*Jour. Indus. Hyg.*, 14 (1932), No. 6, pp. 207-215, figs. 6).—This investigation differs from the one noted above in that the subjects were a smaller group of underweight young women. The supplements to the diet included 1 pt. of milk daily in addition to the cod-liver oil, and the period of supplementary feeding was one year in the case of 45, and two years in the case of 18 subjects. The observations, which were taken during the 5-month period of December to May, inclusive, included changes in weight, absences due to illness, efficiency ratings, and menstrual irregularities.

In the one-year test the addition of the supplements was followed in the majority of instances by an increase in body weight averaging 2.6 lb., a decrease in absence from employment, and an increase in efficiency. There was also some indication of an improvement in menstrual irregularities.

In the two-year test all but 3 of the 18 women gained in weight each year, averaging 4.5 lb. during the first year and 1 lb. during the second year. The average hours of absence for December to May totaled 105.3 for the year previous to the test, 68.4 for the first year, and 40.8 for the second year, representing a total reduction of 61 percent. The average efficiencies for the group during the same three years were 77.8, 78.8, and 80.1 percent, respectively.

The authors conclude that "the addition of cod-liver oil and milk to the usual home diet contributes very materially to the well-being and efficiency of underweight young women dependent upon their ability to work for a livelihood."

[Vitamin A studies in Indiana] (*Indiana Sta. Rpt. 1932*, p. 57).—Loss of vitamin A is noted in exposure of butter to ultraviolet light, in the treatment of cod-liver oil and of butterfat with charcoal, and in the preparation of commercial butter coloring matter from annatto seed.

Vitamin A in body and liver oils of some Philippine fishes, D. M. BIROSEL, and N. J. SISON (*Univ. Philippines, Nat. and Appl. Sci. Bul.*, 2 (1932), No. 1, pp. 7-13, pls. 5).—Antimony trichloride color tests for vitamin A are reported for the body and liver oils of 44 varieties of Philippine fish and the body oils of 7 locally known types of shrimp and 2 of crabs. As only qualitative estimates in terms of deep, medium, and pale blue are given, the results reported are not of great significance. It is of interest, however, that the body oils of the shrimps gave a paler color than those of fish, and those of crabs a still paler color. As was to be expected, the fish liver oils gave a much deeper color than the body oils.

Discussion on vitamin-A and the carotenoids (In *Chemistry at the Centenary (1931) Meeting of the British Association for the Advancement of Science*. Cambridge: W. Heffer & Sons, 1932, pp. 79-126, pl. 1, figs. 3).—This symposium includes an introduction by F. G. Hopkins (pp. 79-81), followed by reports of recent research on the subject as follows: Carotenoids and Vitamin-A, by P. Karrer (pp. 82-91); Biochemical Experiments with Carotenes and Vitamin-A, by H. von Euler (pp. 92-101); Spectrographic Investigations in Connexion with Vitamin-A, by R. A. Morton and I. M. Heilbron (pp. 102-107); Preparation of Isomeric Carotenes and Their Biological Effects, by R. Kuhn (pp. 108-115); Steps in the Concentration of Vitamin-A, by T. Moore (pp. 116-122); and Contribution to Discussion on Vitamin-A, by J. C. Drummond (pp. 123-126). Many references to the original literature are included.

Discussion on the chemistry of vitamin-B and related problems (In *Chemistry at the Centenary (1931) Meeting of the British Association for the Advancement of Science*. Cambridge: W. Heffer & Sons, 1932, pp. 127-162).—Included in this symposium are the following papers: The Isolation of

Vitamin-B₁, by B. C. P. Jansen (pp. 127-130); The Vitamin-B Complex, by R. A. Peters et al. (pp. 131-146); Contribution to Discussion on Vitamin-B, by J. C. Drummond (pp. 147, 148); Crystalline Preparations of Vitamin-D Obtained by Distillation, by R. K. Callow (pp. 149-154); Ergosterol, by A. Windaus (p. 155); Isolation of a Crystalline Antirachitic Reaction Product from Irradiated Ergosterol, by E. H. Reerink and A. van Wijk (pp. 156-158); The Preparation and Properties of Some Ergosterol Ethers, by I. M. Heilbron and J. C. E. Simpson (pp. 159, 160); and Conclusion, by R. Robinson (pp. 161, 162).

Carotene and vitamin A [trans. title], H. VON EULER (*Bul. Soc. Chim. Biol.*, 14 (1932), No. 6, pp. 838-860, fig. 1).—This lecture deals particularly with the extensive researches of the author and his associates on the relationship of carotene to vitamin A. A list of 91 references to the literature is appended.

Carotin in mango fruit (*Mangifera indica* Lin.), R. YAMAMOTO, Y. OSIMA, and T. GOMA (*Inst. Phys. and Chem. Res. [Tokyo] Sci. Papers*, 19 (1932), No. 386, pp. 122-126).—From 38 kg of the fresh pulp of the mango, 0.06 g of a mixture of α - and β -carotene, melting point 179° C., was isolated, together with a small amount of α -carotene, melting point 174°. Daily doses of 0.05 mg of the fraction melting at 179° proved sufficient to cure albino rats suffering from vitamin A deficiency. The distribution of carotinoids in 1 kg of the pulp of the mango was estimated to be carotene 20.41, free xanthophyll 2.7, and ester xanthophyll 13.58 mg.

Intensive vitamin therapy in measles, J. B. ELLISON (*Brit. Med. Jour.*, No. 3745 (1932), pp. 708-711).—The accumulated evidence of damage to epithelial cells as a result of vitamin A deficiency and the well-known damage to such cells in measles, often resulting in acute interstitial pneumonia or in various affections of the skin, ears, and mastoid cells, led to an investigation of the therapeutic effects of liberal dosages of a cod-liver oil concentrate in 300 cases of measles in children under 5 years of age as compared with a well-matched group of the same number receiving no supplement.

In all there were 26 deaths in the control group and 11 in the group receiving the concentrate, or 8.7 and 3.7 percent, respectively. In a previous epidemic involving a total of 4,978 cases the death rate had been 8.1 percent. Nearly all of the deaths in both groups of the present study were from pneumonia. There was no evidence of protection against infections of the middle ear or against skin complications.

"Although the evidence submitted in this experiment scarcely amounts to a demonstration of the value of intensive vitamin therapy in measles, it is difficult to resist the conclusion that some protective effect was obtained in the treated cases which tended to limit the severity of the pulmonary complications. The use of a concentrate rich in vitamin A as a prophylactic against secondary infections in a population of young children known to have been exposed to measles might well repay further study."

On the cause of infections in cases of vitamin-A deficiency, P. ARONS and M. P. J. VAN DER RIJST (*Arch. Néerland. Physiol. Homme et Anim.*, 17 (1932), No. 4, pp. 578-613, figs. 5).—Further evidence that "the infections resulting from a deficiency found in rats deprived of vitamin A probably are not the result of diminished powers of resistance, but of local changes caused by keratinized epithelium and atrophy of the glands" is given in the report of the gross and microscopic examination of various organs of a large number of rats on several test diets, but all deficient in vitamin A. Keratinization without infection was often found but never infection without keratinization. The order in which abscesses occurred in the several organs was roughly the same in all instances, starting with abscesses at the base of the tongue and followed in

later stages by abscesses in the seminal vesicles, salivary glands, and renal pelvis.

Studies on the vitamin-B complex, C. H. HUNT, R. M. BETHKE, and W. WILDER (*Ohio Sta. Bul.* 516 (1933), p. 90).—A continuation of earlier studies (E.S.R., 67, p. 88).

Effect of heat at varying concentrations of hydrogen ion on vitamin B (B_1) in protein-free milk, N. HALLIDAY (*Jour. Biol. Chem.*, 98 (1932), No. 2, pp. 707-717, figs. 2; *abs. in Michigan Sta. Quart. Bul.*, 15 (1933), No. 3, p. 207).—In this investigation at the Michigan Experiment Station, the author, with the assistance of V. E. Hiller, has employed the same materials and in general the same technic as in the earlier study of vitamin G (E.S.R., 67, p. 359) to determine the stability of vitamin B (B_1) to heat and alkalinity. The first series of experiments, noted previously (E.S.R., 68, p. 279), led to the conclusion that in testing for vitamin B in rather highly purified materials some factor or factors apparently present in whole wheat (probably the vitamin B_4 of Reader) must be added to the Sherman-Chase basal diet. Consequently another series of tests was run in which all of the animals received in addition to the skim milk powder or liquid supplement being tested 0.2 g daily of whole wheat.

The data obtained showed that the extraction of vitamin B from the skim milk powder into the protein-free milk was complete, and that in general the stability of the vitamin under the conditions of the experiment was similar to that of vitamin G. "Heating 1 hour caused about 25 percent loss at pH 4.3, 30 percent at pH 7, and 70 to 80 percent at pH 10. Heating 4 hours caused 30 to 40 percent loss at pH 4.3, 40 percent at pH 7, and almost complete destruction at pH 10. Holding the solution 1 week in the cold caused practically no loss at pH 4.3 or pH 7, but nearly complete loss at pH 10."

In discussing these findings with reference to the common belief that vitamin G is more stable to heat than vitamin B, the author states that "it may be possible that the use of the terms heat-labile and heat-stable may have to be discontinued." Attention is called to the probable multiple nature of vitamin G and the consequent difficulty in attempting to make any statement concerning its chemical nature.

The relation of the vitamin B complex to renal enlargement caused by cystine and protein in the diet of the rat, B. B. LONGWELL, R. M. HILL, and R. C. LEWIS (*Jour. Nutrition*, 5 (1932), No. 6, pp. 539-550).—The literature on the role of proteins and their derivatives in the etiology of kidney disease and on the possible relationship of vitamin B to protein metabolism is discussed, and data are reported on an investigation of the effects of high protein and cystine, with and without whole yeast extract, on the kidney structure of male rats.

Both cystine at 0.6 percent level and casein at a 40 percent level caused enlargement of the kidney when the yeast extract was not given as a dietary supplement. Graded doses of the yeast extract up to a certain point caused a progressively decreasing response on the part of the kidney to the administration of cystine or casein. The condition of the kidney is tentatively described as hypertrophy, since no evidence was obtained of degenerative lesions.

The effect of ultra-violet rays on the dermatitis preventing vitamin, A. G. HOGAN and L. R. RICHARDSON (*Missouri Sta. Res. Bul.* 178 (1932), pp. 18, figs. 3).—This publication includes a review of the literature on the differentiation of vitamins B and G, on attempts with varying success and conflicting results to produce dermatitis in rats on diets deficient in vitamin G, and on previous work in the field of the present investigation—the destruction of vitamin G by irradiation. The experimental work reported consisted in the

improvement of technic by means of which, in contrast to the irregular results obtained in a preliminary study (E.S.R., 60, p. 293), dermatitis was produced consistently in rats. Two essentials for consistent success were found to be rigid purification of the ration from the protective factor and irradiation of sufficient intensity to destroy all of the factor.

The preparation of the ration and the technic for irradiation are described in considerable detail, together with the symptoms of the dermatitis produced in all of the animals on the experimental diet. The development of the dermatitis follows a course similar in some respects to the descriptions from other laboratories but differing sharply in certain points. The lesions are limited to the feet, muzzle, eyes, and ears, and there is no loss of fur except in the affected areas. A preliminary histological examination of the lesions by J. W. Kennedy indicated that the dermatitis is of the type described by Findlay (E.S.R., 60, p. 493) and Thatcher, Sure, and Walker (E.S.R., 65, p. 495) rather than that described by Denton (E.S.R., 60, p. 793).

"The question has been raised as to whether the symptoms observed are due to a single or multiple deficiency, but it is impossible to decide that point at this time. No extended effort has been made as yet to determine whether the destruction of vitamin G is complete, or whether partial destruction of other factors occurred. As a matter of fact the designation of any one factor as G must be tentative until it becomes more certain that further differentiation cannot be accomplished. It is entirely possible that there are several types of dermatitis, each due to a different deficiency."

The stability of vitamin C and its relationship to the natural copper content in canned foods [trans. title], E. REMY (*Arch. Hyg. u. Bakt.*, 107 (1932), No. 3-4, pp. 139-154, pls. 2, figs. 9).—Proximate and mineral analyses and biological tests for vitamin C are reported for canned green beans, peas, spinach, apricots, and strawberries, together with determinations of H-ion concentration and reduction capacity for indophenol. The vitamin data are of little quantitative value inasmuch as no attempt was made to determine minimum protective doses, and corresponding values for raw materials were not given. The canned apricots showed no antiscorbutic potency. Values for the other foods were lower than the usually accepted figures for the same foods in the fresh state. The reduction potential values were roughly proportional to the vitamin C values, and this determination is considered of qualitative though not quantitative value. There was some evidence of an inverse relationship between the vitamin C values and copper content of the materials tested.

The role of activated milk in the anti-rickets campaign, A. F. HESS (*Amer. Jour. Pub. Health*, 22 (1932), No. 12, pp. 1215-1219).—This paper and the two noted below were read at a symposium on milks of special antirachitic value before the food and nutrition section of the American Public Health Association at its 1932 meeting.

Special emphasis is given to milk enriched with vitamin D by direct irradiation according to the method developed by Supplee et al. (E.S.R., 67, p. 489) and to the discrepancy between the clinical value of certain antirachitic agents and the laboratory measurements of their vitamin D content. Milk activated by irradiation is considered to have the advantage "not only of providing an automatic method of preventing rickets and of supplying this essential factor in a medium rich in phosphorus and calcium, but, as has been shown, it accomplishes this end by means of an exceptionally small amount of the antirachitic factor. In view of these important advantages I do not hesitate to recommend the general use of such milk for infants and children, especially in large communities."

Protective value for infants of various types of vitamin D fortified milk:

A preliminary report, J. McK. MITCHELL, J. EIMAN, D. V. WHIPPLE, and J. STOKES, JR. (*Amer. Jour. Pub. Health*, 22 (1932), No. 12, pp. 1220-1229, fig. 1).—This preliminary report summarizes laboratory and clinical data obtained by the authors in the determination of the antirachitic potency of (1) milk irradiated with a carbon arc lamp, (2) milk from cows fed irradiated yeast, and (3) milk from cows irradiated with a carbon arc lamp. Particular emphasis is given to the third method of increasing the vitamin D content of milk inasmuch as conflicting results had been obtained in earlier investigations on the subject. The method of irradiating the cows is described in considerable detail. Definite protection against rickets was demonstrated in the preliminary clinical data reported, although the milk contained only about 22 units of vitamin D per quart. "The apparent effectiveness in preventing rickets in infants by such a small number of vitamin D units emphasizes the importance of certain unknown and unmeasured factors in vitamin D fortified milk which deserve further consideration and study."

The addition of vitamin D concentrate to milk, T. F. ZUCKER (*Amer. Jour. Pub. Health*, 23 (1933), No. 1, pp. 10-12).—Further details are given concerning the method of fortifying milk with vitamin D, noted below, together with the characteristics of the milk which, in the opinion of the author, distinguish it from other vitamin D milks. Certain questions of public health interest are raised and answered.

The use of vitamin D from cod-liver oil in milk and bread, T. F. ZUCKER (*Science*, 77 (1933), No. 1984, pp. 19, 20).—The author announces the preparation from cod-liver oil of a concentrate of vitamin D free from objectionable taste and odor and suitable for use in fortifying milk and other foods with vitamin D. The process has been patented by the board of university patents, Columbia University, and the right to manufacture and sell the concentrate in the United States, Canada, and Newfoundland has been leased to the National Oil Products Company.

Irradiated milk: The influence of the intensity and character of the radiations on the antirachitic potency, G. C. SUPPLEE, H. H. BECK, and M. J. DORCAS (*Jour. Biol. Chem.*, 98 (1932), No. 2, pp. 769-782, figs. 4).—This paper reports an extension of studies noted previously (*E.S.R.*, 67, p. 490) to the application of lower amounts of energy of different quality to milk under uniform conditions. The radiations used were obtained from carbon arcs of the flaming arc type and quartz mercury vapor arcs of the Hanovia type. The intensity of the direct radiations from each of these sources was varied by changing the amperage of the arc stream while maintaining a constant voltage and by using reflected rays from nickel and chromium reflecting surfaces. Both the character and intensity of the radiations were varied by the use of Corex D and mica filters.

The data are reported in tables showing the relation between the amount of energy applied to the milk and its vitamin D concentration and also in charts on which the calculated numbers of molecules of vitamin D per cubic centimeter of milk were plotted on logarithmic paper against the energy in quanta applied per cubic centimeter of milk.

The total radiations from unscreened sources produced a higher antirachitic potency in the milk than did the filtered radiations. This is attributed to the reduction of total energy applied per unit of time. A definite intensity of radiation within the antirachitic range was found to be necessary for effective activation of the milk. For unscreened sources, this range is given as from approximately 6×10^{16} quanta to 5×10^{17} quanta per cubic centimeter of milk.

Between these limits the effectiveness of equivalent amounts of energy varied with the source of radiation. "The relative effectiveness of an equivalent amount of energy from the different sources was found to be in the following order: C carbon, magnesium carbon, mercury vapor arc, and sunshine carbon, respectively. It should be noted, however, that when time and intensity are considered for practical purposes, the effectiveness of the different sources increases in the following order: Mercury vapor arc, sunshine carbon arc, magnesium carbon arc, and C carbon arc."

Vitamin G in root and leaf vegetables, P. L. DAY (*South. Med. Jour.*, 24 (1931), No. 10, pp. 876-878, figs. 4).—Following the technic as described previously (E.S.R., 66, p. 794), the author has determined the vitamin G content of several root and leaf vegetables purchased as needed at retail markets (Little Rock, Ark.) and fed in the fresh state. The materials used and the values obtained, expressed as Bourquin units, are beets 0.5, beet tops 2.5, carrots 0.5, carrot tops 2.0, potatoes 0.3, spinach (winter) 1.0, turnips 0.5, and turnip tops 3.0 units per gram. These values confirm the general impression that leaf vegetables are richer in vitamin G than root vegetables.

The calcium and phosphorus content of the brain in experimental rickets and tetany, A. F. HESS, J. GROSS, M. WEINSTOCK, and F. S. BERLINER (*Jour. Biol. Chem.*, 98 (1932), No. 2, pp. 625-636).—"Rickets in the rat is associated with a marked decrease of total calcium in the brain. The percentage of inorganic phosphate is similarly decreased. These changes come about in spite of the fact that the diet is high in calcium. The return to normal levels is slow. There is no relationship between the concentration of calcium in the blood and its concentration in the brain. In rickets the total calcium is normal in the blood and diminished in the brain. In parathyroid tetany it is low in the blood and undiminished in the brain."

Magnesium rickets [trans. title], G. MEYER ZU HÖRSTE (*Klin Wehnschr.*, 11 (1932), No. 43, p. 1796).—Evidence is summarized briefly leading to the conclusion that the addition of magnesium carbonate to a nonrachitic diet produces rickets in rats and rabbits similar to the type produced by an excess of calcium carbonate. In the histological and blood chemistry changes the magnesium rickets resembled infantile rickets and responded to the same curative agents. It is suggested in considering the cause of rickets that attention should be paid to the ratio of calcium and magnesium to phosphorus.

Food supply and pellagra incidence (*Jour. Amer. Med. Assoc.*, 99 (1932), No. 25, pp. 2116, 2117).—Editorial comment is given on the pellagra studies reported by Stiebeling and Munsell (E.S.R., 68, p. 421).

Experimental production of mottled enamel, M. C. SMITH and E. M. LANTZ (*Arizona Sta. Tech. Bul.* 45 (1933), pp. 325-359, pls. 18).—This publication describes, with excellent photographic illustrations, the experimental production of mottled enamel in albino rats, dogs, and guinea pigs.

In rats the condition was produced in three ways, (1) by administering the drinking water or concentrates from the drinking water from a locality where mottled enamel is endemic (E.S.R., 65, p. 596), (2) by feeding sodium fluoride at levels of 0.025, 0.05, and 0.1 percent of the ration, and (3) by injecting the fluoride subcutaneously or intramuscularly.

In dogs the condition was produced by feeding sodium fluoride at levels of 0.025 and 0.05 percent and in guinea pigs at a level of 0.05 percent. Mottled enamel was also produced in a single guinea pig by the subcutaneous injection of 0.6 cc of a 2.5 percent solution of sodium fluoride.

In rats the first indication of dental abnormality was lack of pigment, followed by loss of luster. In severe cases the enamel became corroded and

pitted and sections tended to chip off. In dogs and guinea pigs, the teeth of which are less pigmented and translucent, the chief characteristic of the defect was the corrosion and chipping off of the enamel.

TEXTILES AND CLOTHING

Preparing wool for market, W. M. BUCK (*U.S. Dept. Agr. Leaflet 92* (1933), pp. 4, figs. 7).—Practical instructions are given on care during shearing the sheep, and on preparing, tying, and packing the fleece.

The influence of position isomerism in azo dyes upon fastness to light and washing, M. GRIFFITH (*Ohio Sta. Bul. 516* (1933), pp. 94, 95).—This progress report lists the dye intermediates which have thus far been prepared for use in the preparation of a series of naphthalic azo dyestuffs to determine the influence of substitution of sulfonic groups on the affinity of the dyestuffs to various types of fibers and the fastness of the dyed fabrics to light and washing.

HOME MANAGEMENT AND EQUIPMENT

[**Studies in home management and equipment in Indiana**] (*Indiana Sta. Rpt. 1932*, pp. 43, 44).—Included in this progress report (E.S.R., 67, p. 637) are a comparison of the efficiency of an insulated gas oven with the electric ovens studied previously, and data on the time spent by rural home makers in kitchen tasks. Current consumption records for one year for electric ranges, refrigerators, washing machines, irons, and a household water pump are also noted.

Factors affecting the performance of kerosene cook stoves, E. B. SNYDER (*Nebraska Sta. Res. Bul. 64* (1932), pp. 22, figs. 5).—The purpose of this investigation was to learn the effect of constructional details of the burner and the framework on the performance of kerosene stoves. Six stoves were used, 4 of the long-chimney type and 2 of the short-chimney type. Of the short chimneys one burner used a wick, the other a lighting ring. The effect of (1) draft variations and constructional details and (2) the framework on the heating time and thermal efficiency of stoves was studied.

The results show that the draft of long-chimney burners is greater than that of short and is affected by the height and diameter of the chimney and the size and arrangement of openings for air. Because of the greater draft in long-chimney burners the rate of combustion is higher, resulting in a more powerful but slightly less thermally efficient burner than the short.

Differences in performance of long-chimney burners are due to such constructional details as height and diameter of chimney, size and arrangement of openings for air (particularly in the flame spreader), angle of collar on which the chimney rests, and the distance between the flange and the top of the flame spreader. Such features are fundamental because they direct air currents and mix air with kerosene vapor.

No improvement in heating time and thermal efficiency resulted from interchange of chimneys on long-chimney burners from the same manufacturer. The best results were obtained with the original combination. One combination was slightly superior in performance to the other three. An increase in chimney diameter on one short-chimney burner decreased the heating time but lowered the thermal efficiency. The performance of burners in the cabinet was generally superior to the performance on the stoves. These results suggest the importance of insulation of burners.

Relative distance of grate from chimney top affected heating time and thermal efficiency. Heating time decreases and thermal efficiency increases as

the distance between grate and chimney top decreases. However, there appears to be an optimum distance for each burner because less than this distance results in the formation of soot and odor. The shape and weight of the grate and elevations on it are important factors affecting burner performance. Enclosure of the sides and back improves burner performance, especially where the stove is exposed to outside draft. Long chimneys are not affected by draft to the extent that short chimneys are.

Heating the farm home, A. H. SENNER (*U.S. Dept. Agr., Farmers' Bul. 1698 (1933), pp. II+18, figs. 7*).—This supersedes Farmers' Bulletins 1174 and 1194 (E.S.R., 44, p. 588; 45, p. 188). It discusses the requirements that should be met and the characteristics of different types of heating systems, and gives advice on selecting heating plants for farm homes and on ways of conserving heat.

MISCELLANEOUS

Report of the Alaska Agricultural Experiment Stations, 1931, 1932, H. W. ALBERTS ET AL. (*Alaska Stas. Rpt. 1931-1932, pp. [2]+26, figs. 4*).—This, the final report on these stations (E.S.R., 67, p. 353), briefly reviews their activities as a whole and reports experimental work for the biennium ended June 30, 1932, for the most part noted elsewhere in this issue. Findings in a survey of the grazing possibilities of the Moose Pass region are also included.

Report of the [California] Agricultural Experiment Station, [1932], C. B. HUTCHISON (*California Sta. Rpt. 1932, pp. [2]+106, figs. 17*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fifty-fifth Report of the Connecticut Agricultural Experiment Station, New Haven, for the year 1931, W. L. SLATE ET AL. (*Connecticut State Sta. Rpt. 1931, pp. XII+850+74, pls. 19, figs. 100*).—In addition to the usual administrative data, this report contains reprints of Bulletins 331-342, previously noted, and of the following circulars: Nos. 81, Requirements for Tree Workers in Connecticut (pp. 1-11); 82, Testing Vegetables for Connecticut: Results for 1931, by D. F. Jones and L. C. Curtis (pp. 13-24); 83, Lawn Seeding and Care (pp. 25-28); 84, The Elm Leaf Beetle Outbreak (pp. 29-34), and 85, Quarantine Restrictions Affecting Shipments of Connecticut Plants, 1932 (pp. 35-43), both by W. E. Britton; and 86, Regulations Concerning Transportation of Nursery Stock in the United States and Canada, compiled by W. E. Britton (pp. 45-74).

[Forty-first and Forty-second Annual Reports of Connecticut Storrs Station, 1929-1930], W. L. SLATE ET AL. (*Connecticut Storrs Sta. Rpts. 1929, pp. [4]+251, pls. 14, figs. 12; 1930, pp. [271], figs. 89*).—The first of these reports consists of Bulletins 162-169, all of which have been previously noted. The report for 1930 contains Bulletins 170-175, previously noted, and Special Bulletin, The Drawing and Handling of Blood Samples for the Serological Diagnosis of Bang's Abortion Disease, noted on page 107.

Annual report of the director [of Delaware Station] for the fiscal year ending June 30, 1932, C. A. McCUE ET AL. (*Delaware Sta. Bul. 179 (1932), pp. 55, figs. 2*).—The experimental work not previously referred to is for the most part abstracted elsewhere in this issue.

Twelfth Annual Report [of Georgia Coastal Plain Station], 1931, S. H. STARR (*Georgia Coastal Plain Sta. Bul. 19 (1932), pp. 104, figs. 8*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-fifth Annual Report of [Indiana Station], 1932, J. H. SKINNER and H. J. REED (*Indiana Sta. Rpt. 1932, pp. 91, figs. 24*).—The experimental

work not previously referred to is for the most part abstracted elsewhere in this issue.

Report of agricultural research [of the Iowa Station] for the year ending June 30, 1932, C. F. CURTISS ET AL. (*Iowa Sta. Rpt. 1932, pp. 128, figs. 12*).—The experimental work not previously abstracted is for the most part noted elsewhere in this issue.

Annual Report of [Nevada Station], 1932, [S. B. DOTEN] (*Nevada Sta. Rpt. 1932, pp. 37, figs. 15*).—This report is devoted mainly to a discussion of the history, progress, and problems of the station since its establishment. Data on experiments with sheep are noted on page 93.

Forty-fifth Annual Report [of New York Cornell Station], 1932, C. BETTEN ET AL. (*New York Cornell Sta. Rpt. 1932, pp. 183*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fifty-first Annual Report of [Ohio Station], 1932, C. G. WILLIAMS ET AL. (*Ohio Sta. Bul. 516 (1933), pp. 129, figs. 12*).—The experimental work reported not previously referred to is for the most part noted elsewhere in this issue.

Report of the Puerto Rico Agricultural Experiment Station, 1932, T. B. MCCLELLAND ET AL. (*Puerto Rico Sta. Rpt. 1932, pp. [2]+24, figs. 8*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Michigan Agricultural Experiment Station Quarterly Bulletin [February 1933], edited by V. R. GARDNER and A. J. PATCH (*Michigan Sta. Quart. Bul., 15 (1933), No. 3, pp. 141-214, figs. 26*).—In addition to articles abstracted elsewhere in this issue, the number includes the following: New Soy Bean Varieties Tested, by C. R. Megee and H. L. Dunton (pp. 152, 153), reporting soybean variety tests; Cost of Producing Eggs in 1932, by P. F. Aylesworth (pp. 157-160), an analysis of the laying flock records of 40 Michigan poultrymen; and Michigan Contest Completes Tenth Successful Year, by E. S. Weisner (pp. 175-177), a cost analysis study of the Tenth Annual Michigan Egg Laying Contest.

NOTES

Colorado Station.—The resignation is announced of Dr. W. G. Sackett, bacteriologist.

Connecticut College.—The name of the institution has been changed by the legislature from Connecticut Agricultural College to Connecticut State College. This change has been made chiefly, it is announced, in order that the name may conform as closely as possible to the activities of the college.

Delaware Station.—Three new brooder houses have been added to the equipment of the poultry plant. P. B. Myers, chemist, has resigned, effective March 1, in order to engage in commercial work in New York City.

Georgia College and Station.—An act of the 1933 session of the legislature appropriates all funds for the State university system, which includes the station, in a lump sum, leaving to the regents an annual allotment between the various units of the system. The regents were also given the right to integrate or abolish different units as may seem best for the State. Under this provision, activities at Athens have been combined in a single institution under Dr. S. V. Sanford as president. Director H. P. Stuckey of the station has also been appointed dean of the College of Agriculture, beginning July 1.

Idaho University.—A gift of 3,646 acres of forest land has been made to the university by the Forest Development Company of Lewiston for development as an experimental forest. The tract is located on Moscow Mountain about 20 miles from the university and will be known as the Moscow Mountain Experimental Forest. While practically all the merchantable timber has been removed, undersized trees were left intact on most of the area, so that natural regeneration will make replanting largely unnecessary. The forest will serve as a field laboratory for the training of forestry students and experimentation in methods of silvicultural management, as well as a game preserve and for recreational purposes.

Purdue University and Station.—A bequest of approximately \$400,000 has been made to the university by the late Hon. William R. Wood of La Fayette, Member of Congress from the Tenth Indiana District for many years.

The regular session of the legislature appropriated to the station \$218,000 per year for the ensuing biennium as compared with \$275,000 for the present biennium.

Kentucky Station.—Wesley Brooks, agent in cream improvement, has resigned.

Minnesota Station.—In cooperation with the county agricultural agents the soils and agricultural engineering divisions of the station are demonstrating the Mangum terrace in soil erosion control in three counties in southeastern Minnesota. One farm has been selected in Houston, Winona, and Goodhue Counties for the demonstration. The station is providing the plan for the terraces and the technical service in building them, the county agent in each instance makes the local arrangements, and the owner of the farm where the demonstration is made supplies the power and labor for building the terrace. The erosion demonstrations will be used as educational projects in the county

in an attempt to lessen the soil losses from erosion, which in many of these counties is of serious consequence.

New Jersey College and Stations.—Announcement is made that the stations have perfected a vaccine for immunizing poultry against infectious bronchitis.

Dr. Gordon T. Nightingale, biochemist in horticulture, is now stationed at the University of Chicago where he is carrying on some fundamental studies on the nutrition of tree fruits. This research represents a cooperative enterprise supported by the stations, the University of Chicago, and the Boyce Thompson Institute for Plant Research.

Recent appointments included the following: Dr. Edgar A. Slagle as research chemist, Marion F. McDowell, extension specialist in child training and parent education, and as research assistants Harold E. Clark (plant physiology), Louis T. Kardos (soil chemistry), Alun J. Pugh (soils), Robert A. Voelker, and John Ziemba.

Association of Land-Grant Colleges and Universities.—The forty-seventh annual convention of this association is to meet in Chicago from Monday morning, November 13, to Wednesday noon, November 15, 1933.

Fifth World's Poultry Congress.—This congress will be held in Roma from September 6 to 15 under the patronage of the King of Italy and with the Italian Ministry of Agriculture and Forestry in charge of arrangements.

Meetings will be held in the Capitol and at the International Institute of Agriculture, with an exhibit of poultry and poultry accessories in the historic Trajan's Markets. The program will be organized into sections of general and genetic questions, physiology, nutrition, and breeding, hygiene and diseases, instruction and organization, economic problems and trade in poultry products, and rabbit raising. At the close of the congress an extensive tour will be made of important breeding regions in northern Italy.

Agricultural Meteorology in India.—A section of agricultural meteorology of the Meteorological Department of India was established at Poona in September, 1932. It is financed by the Imperial Council of Agricultural Research and is provided for provisionally for a period of three years, with Dr. L. A. Ramada in charge.

New Journals.—*Pure Culture Study of Bacteria* is being issued quarterly by the committee on bacteriological technic of the Society of American Bacteriologists, under the direction of the chairman of the committee, Dr. H. J. Conn of the New York State Experiment Station, Geneva, N.Y. Its primary purpose is as a successor to the Continuation Service of the Manual of Methods for Pure Culture Study of Bacteria, which was issued at irregular intervals from 1923 to 1931. Each number will consist of two sections, the first containing editorials, reviews of literature, and special articles; the second, one or more revised leaflets for the manual. The object and scope of the journal are set forth in detail in the initial number.

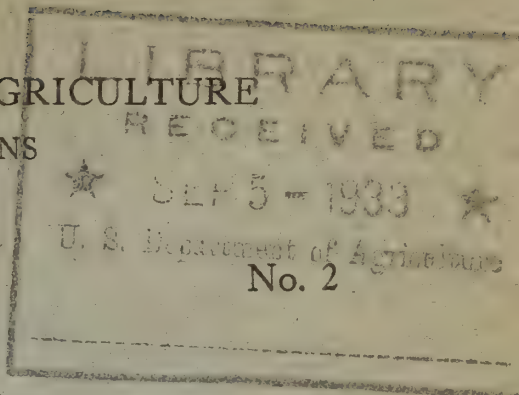
Bollettino del R. Ufficio per i Servizi Agrari della Tripolitania is being published monthly by the Agricultural Service Office of Tripolitania at Tripoli. The initial number contains articles entitled An Extension of Dry Land Agriculture Needed in Farm Management Programs in Tripolitania, by G. Vivoli (pp. 5-7), and The Principal Pastoral Products in Libya, by E. Ducros (pp. 9-17).

Field and Laboratory is being published semiannually by the science departments of Southern Methodist University, Dallas, Tex. The initial number includes an article by M. L. Whitsitt entitled Equipping a Vitamin Laboratory on Depression Funds (pp. 11-14).

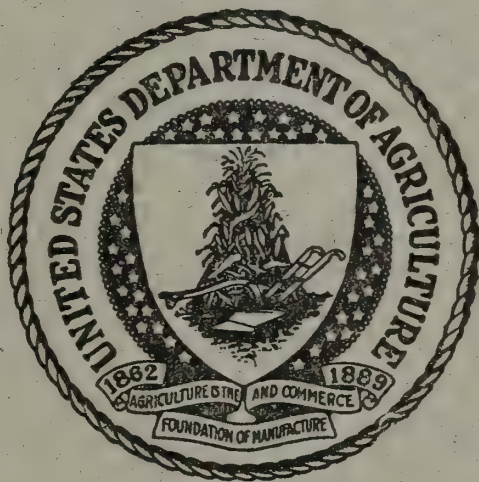
UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS

Vol. 69

AUGUST 1933



EXPERIMENT STATION RECORD



By direction of the Secretary of Agriculture, the matter contained herein
is published as administrative information required for the
proper transaction of the public business

For sale by the Superintendent of Documents, Washington, D.C. - - - - - Price 15 cents
Subscription per volume (2 volumes a year) consisting of 6 monthly numbers and index, \$1.00
Foreign subscription per volume, \$1.50

EXPERIMENT STATION RECORD

Editor: HOWARD LAWTON KNIGHT

EDITORIAL DEPARTMENTS

Agricultural and Biological Chemistry—H. C. WATERMAN, SYBIL L. SMITH.
Agricultural Meteorology—W. H. BEAL.
Soils and Fertilizers—H. C. WATERMAN.
Agricultural Botany, Diseases of Plants—W. E. BOYD, J. W. WELLINGTON,
H. M. STEECE.
Genetics—H. M. STEECE, J. W. WELLINGTON, G. HAINES.
Field Crops—H. M. STEECE.
Horticulture and Forestry—J. W. WELLINGTON.
Economic Zoology and Entomology, Veterinary Medicine—W. A. HOOKER.
Animal Husbandry, Dairying, and Dairy Farming—H. W. MARSTON.
Agricultural Engineering—R. W. TRULLINGER.
Agricultural Economics—F. G. HARDEN, B. YOUNGBLOOD.
Rural Sociology—B. YOUNGBLOOD, F. G. HARDEN.
Agricultural and Home Economics Education—F. G. HARDEN.
Foods and Human Nutrition—SYBIL L. SMITH.
Textiles and Clothing—H. M. STEECE, SYBIL L. SMITH.
Home Management and Equipment—
Indexes—MARTHA C. GUNDLACH.
Bibliographies—CORAL L. FELDKAMP.

CONTENTS OF VOL. 69, NO. 2

	Page
Editorial:	
Fiftieth anniversary of the Alabama and Wisconsin Experiment Stations	161
Recent work in agricultural science	165
Agricultural and biological chemistry	165
Agricultural meteorology	175
Soils—fertilizers	178
Agricultural botany	187
Genetics	190
Field crops	198
Horticulture	209
Forestry	217
Diseases of plants	219
Economic zoology—entomology	229
Animal production	248
Dairy farming—dairying	257
Veterinary medicine	265
Agricultural engineering	281
Agricultural economics	287
Rural sociology	299
Agricultural and home economics education	302
Foods—human nutrition	303
Textiles and clothing	315
Home management and equipment	317
Miscellaneous	317
Notes	319

EXPERIMENT STATION RECORD

VOL. 69

AUGUST 1933

No. 2

EDITORIAL

FIFTIETH ANNIVERSARY OF THE ALABAMA AND WISCONSIN EXPERIMENT STATIONS

The year 1883 increased to eleven the number of States in which experiment stations had been formally organized in this country. In February Alabama joined North Carolina and Tennessee in the southern group, and in the fall Wisconsin supplemented Ohio in the middle western area. In the Northeast Connecticut, Massachusetts, New York, and New Jersey, and in the far West California and Colorado were the remaining States represented a half century ago.

In both Alabama and Wisconsin considerable experimental work in agriculture had preceded formal station organization. Field trials with fertilizers on cotton were made by the A. and M. College (later the Alabama Polytechnic Institute) in northern Alabama as early as 1875, and at about the same time experimental work was begun on the college grounds at Auburn. About 1880 the work was broadened under the direction of Professor of Agriculture William H. Chambers and later of Dr. W. C. Stubbs, professor of natural science. By 1882 it had included tests of varieties of cotton, wheat, grasses, clovers, peaches, strawberries, and grapes; fertilizer experiments with cotton, corn, and potatoes; and a few chemical analyses of grapes and a kind of sorghum.

In Wisconsin a portion of the university land was set apart as an experimental farm in 1868, and from then until 1880 William W. Daniels, professor of agriculture and analytical chemistry, conducted experiments with varieties of cereals and other farm crops and cultural studies with wheat and corn. A test of Manshury barley, later to become an important crop in Wisconsin, was begun in 1872. In 1880 Prof. Daniels was succeeded in the agricultural field by the late Dr. William Arnon Henry, an account of whose career recently appeared in these columns (E.S.R., 68, p. 429). Prof. Henry soon enlarged the work, some of his early ventures dealing with the utilization of sorghums for sirup and sugar and the ensilage of fodders, for which purpose small special appropriations by the State legislature became available in 1881 and 1882.

These studies aroused much interest, and in 1883 Governor Jeremiah M. Rusk, later to become Secretary of Agriculture, recommended the establishment of an experiment station at the university. This recommendation was approved in an act signed April 2, and the station was formally organized on October 1, 1883. No specific funds were allotted to the station, but the university appropriations were appreciably increased.

For some time the station was operated by a joint committee, consisting of Profs. Henry, William Trelease, and H. P. Armsby, but in 1886 Prof. Henry was made director and Dr. Armsby associate director. Much of the work with cereals and potatoes was still continued, but special emphasis was placed on the development of systems of farming in the State based on dairy husbandry. Feeding experiments with dairy cows, calves, steers, and pigs were undertaken; feeding stuffs, rations, and methods of feeding were investigated; and dairy products were studied, as were problems relative to nutritive ratios and feeding standards and the effect on quantity and quality of milk production of varying proportions of protein to carbohydrates and fat in the ration. Still another line of work to be extensively developed was plant pathological studies.

Meanwhile in Alabama provision had also been made by the legislature for an experiment station at the college. A farm nearby was purchased for its use, and a part of the proceeds of a tonnage tax on fertilizers was allotted for maintenance. Prof. James Stanley Newman was made director upon the organization of the station, with Dr. Stubbs (*E.S.R.*, 51, p. 101) as chemist. The latter began numerous researches, including the composition of the phosphates and greensands of Alabama and the chemistry of sugarcane. Other early work of the station consisted largely of variety and fertilizer tests with field crops, orchard fruits, grapes, and vegetables, and some extensive inbreeding was carried on with Jersey cattle.

The passage of the Hatch Act in 1887 thus found a diversified and well-established program under way in both these States, many creditable accomplishments, and a steadily widening influence. Shortage of space precludes a recounting of their subsequent history at this time, but the opportunity is welcomed to extend to both stations the hearty congratulations of the *Record* for their half century's notable service.

Exercises in observance of the fiftieth anniversary of the Wisconsin Station were held June 3, 1933, in connection with a Farmers' Field Day. At these exercises a telegram was read from the Federal Department of Agriculture felicitating the station upon "its progress in articulating the natural and social sciences and focusing their energies upon rural economic and social objectives and upon the flexibility, foresight, and aggressiveness of its organization which enables it to serve progressively the changing needs of agriculture and rural

life. The spirit of cooperation and vision of the more human problems affecting agriculture which has characterized its development suggest that your accomplishments during the next 50 years will far outdistance the remarkable achievements of your research workers in the past."

The principal speaker for the day was Dr. Eugene Davenport, dean emeritus of the College of Agriculture of the University of Illinois, who took for his subject Research the Master Key to an Advanced Civilization. Dean Davenport paid warm tribute to the State of Wisconsin as a pioneer "in midwest organization in the systematic prosecution of research in the facts and principles that underlie the successful practice of the most fundamental industry of mankind." He pointed out that pioneering means "exploring new territory in the dark, with few sympathizers and fewer helpers but with no dearth of critics," and he gave large praise to such workers as Henry, Babcock, Goss, and Russell, because "whatever progress was made in the early days was the result of individual initiative, even insistence. For at best these men were tolerated, not encouraged. They not only had to build the machinery to serve agriculture through the findings of science but they were obliged to overcome prejudice on every hand; prejudice within the institution at this 'prostitution of education to mere commercial ends', prejudice among the farmers who quite generally assumed that the way to farm is to farm, and that what had served the fathers would also serve the sons, *ad infinitum*."

In spite of these and other difficulties the stations won their way until research had become recognized as an essential element in the field of agriculture. Indeed, as Dean Davenport made clear, "it was this fact of research that first gave farming respectable standing in the academic world." Even more significant progress attended the vitally important matter of gaining and holding the respect and esteem of farmers.

Dean Davenport cautioned against overindulgence in retrospect, however, pointing out that problems lie ahead which "will tax the best talent and the best statesmanship of which this generation is capable if they are to be successfully met and if the advance of knowledge is to keep pace with the demands of an advancing civilization." The idea sometimes encountered that "we have enough of research and of invention to last for a generation or more" was vigorously denied. In reality, he said, "there is never the slightest danger that we shall be too well informed in matters essential to human happiness and progress. Indeed the danger is in the opposite direction, and it is only the conceit of ignorance that would proceed in the dark as new problems arise . . . almost day by day."

Speaking more specifically of agriculture, Dean Davenport went on to say that "we have made a good beginning in agricultural

research. We have laid many a ghost in the form of ancient traditions and faulty practices. We have learned to speak glibly of balanced rations and of vitamins, of unit characters and of genes, of mutations and of bud variations. But there are new puzzles. I see that this station reports that the quality of tobacco is improved by continuous growth on the same land. Why? And why is it that legumes, with rare exceptions, cannot be continuously grown on the same lands? Why? and why the exceptions? Why will that roistering pest the Canada thistle refuse to grow with alfalfa? And why will it grow successfully with alfalfa's first cousin, sweetclover? Why? why? why? An endless array of whys awaits the investigator, for so wondrous in nature that every time he solves one mystery he opens up two questions." In view of these things he raised the direct question, "Are we to be content with these first fruits of research, mulling them over generation after generation like a ruminant chewing its cud, or are we to go forward upon the path which our fathers so thoroughly blazed ahead for us?"

Alleging that just now "the widespread insistent demand for economy threatens the very existence not only of research but of our system of public education on which the structure of our civilization and our form of government rests," Dean Davenport recalled that "our fathers did not establish our national system of education and research out of their abundance." Not only did the system find birth under war conditions but when the "population was only a fourth of what it is today and the wealth but a fraction. . . . Not only that but every enlargement of the work has been made in or near times of distress. The experiment stations were added to the colleges of agriculture before we were out of the woods in the aftermath of the Civil War. The second Morrill Act, as well as the Adams Act, was in close company with a depression, the one of 1893, the other of 1907."

Without in any way minimizing the acute needs of the day for economy in public expenditures, Dean Davenport drew attention to the small outlay in education and research in comparison with what is frittered away by individuals on what he termed "an unnumbered mass of purely personal pleasures." As typical of this situation, he averred that the entire cost of maintaining a large midwestern university some years ago could have been defrayed by the capital dissipated by a single 50-mile pleasure ride of each automobile within that State. Furthermore, he concluded that the question of adequate provision for the needs of today and tomorrow is fundamentally one of relative values. In this conclusion there will be wide concurrence. A wise decision will mean much, not merely to the individual institutions and their personnel, but to the States and the nation which they serve.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Studies on glutelins.—VII, Cystine, tryptophane, and tyrosine content of glutelins, F. A. CSONKA (*Jour. Biol. Chem.*, 97 (1932), No. 1, pp. 281–286).—This series of contributions (E.S.R., 65, p. 108) is here extended by an account of determinations of the cystine, tryptophane, and tyrosine content of glutelins isolated by the author's special method from the cereals wheat, rice, corn, rye, barley, and oats. Some modifications are described for the colorimetric determination of cystine by the Sullivan method, and of tryptophane by the May and Rose method (E.S.R., 48, p. 312).

The action of sulfite upon cystine, H. T. CLARKE (*Jour. Biol. Chem.*, 97 (1932), No. 1, pp. 235–248, fig. 1).—From the behavior of cystine in a number of reactions reported upon, the author concludes that in the action of sulfite upon cystine (1) no sulfate is formed; (2) only one half of the cystine is converted to cysteine; and (3) the other half is converted into a salt of S-cysteinesulfonic acid.

The influence of substituent groups on the visible and ultra-violet absorption spectra of amino acids and related substances, G. A. ANSLOW and M. L. FOSTER (*Jour. Biol. Chem.*, 97 (1932), No. 1, pp. 37–46, figs. 4).—In this study of the absorption spectra of selected amino acids and related compounds, it was found that symmetrically formed molecules absorbed light energy selectively, with a weakening of the linkage between the α , β -carbon groups, as in the case of aspartic, glutaminic, and succinic acids, and between the —S—S— groups in cystine. In the case of cystine in HCl solution this disruption resulted in the formation of cysteine chloride and cysteine, and, when the reaction took place in water, cysteine hydroxide and cysteine.

“The frequency of the light which produces dissociation of the carboxyl group is the sum of the electronic frequency, ν_e , in this case the limiting frequency of the Balmer series of hydrogen, and of the natural frequency of vibration, ν_m , of the molecular ion.”

The production of hydroxylamine by the reduction of nitrates and nitrites by various pure cultures of bacteria, G. A. LINDSEY and C. M. RHINES (*Jour. Bact.*, 24 (1932), No. 6, pp. 489–492).—A contribution from the North Dakota Experiment Station reports that hydroxylamine has been demonstrated as a reduction product of nitrates and nitrites in broth cultures of *Aerobacter aerogenes*, *Escherichia coli*, *Staphylococcus aureus*, *Bacillus subtilis*, *B. vulgaris*, *B. ramosus*, and *Bacterium anthracoides*. “The fact that these organisms represent such a diversity of types strongly suggests that the production of hydroxylamine is characteristic of the bacterial reduction of nitrites.”

The isolation of trimethylamine from spores of *Tilletia levis*, the stinking smut of wheat, W. F. HANNA, H. B. VICKERY, and G. W. PUCHER (*Jour. Biol. Chem.*, 97 (1932), No. 2, pp. 351–358).—A contribution from the Connecticut State Experiment Station reports an investigation in which it was shown that the amount of the total volatile base and ammonia obtainable from a collection of *T. levis* or *T. tritici* spores depends upon the wheat variety on which the spores have developed, the ammonia content of the spores varying from 54 to

143 mg per 100 g of spores. Distillates from *T. levis* spores were shown to have a higher content of total volatile base and to exhibit greater differences between total volatile base and ammonia than do those from *T. tritici* spores.

"Freshly collected spores of *T. levis* emit an odor resembling that of herring brine. Trimethylamine was isolated from these spores, and it is considered to be the substance responsible for their odor. The trimethylamine content of these spores was probably between 3.6 and 12 mg per 100 g of spores. Spores of *T. tritici*, even when freshly collected, did not emit the odor of trimethylamine, and none of this substance could be detected in distillates obtained from these spores."

The isolation of norleucine, with evidence for its identity, and some thermodynamic data based on the dissociation pressures of the compounds which the isomeric lucines form with ammonia and hydrogen chloride, E. J. CZARNETZKY and C. L. A. SCHMIDT (*Jour. Biol. Chem.*, 97 (1932), No. 2, pp. 333-343, figs. 8).—The isolation of norleucine from spinal cord protein, and the identification of the compound with synthetic norleucine by means of its crystal structure, the crystal structure of its copper and silver salts, and the ammonia and hydrogen chloride dissociation pressures, are recorded.

The ammonia and hydrogen chloride dissociation pressures of the three isomeric leucines were determined, together with values for the change in free energy, the change in heat content, and the change in entropy due to dissociation of the ammonia and hydrogen chloride compounds of the three isomeric leucines. A method for determining the relative amounts of leucine and norleucine when present in a mixture of the two amino acids by titration with gaseous ammonia is described; and it is shown "on the basis of the dissociation pressures and the thermodynamic data that the amino acids which have been studied exist when in the dry state as Zwitter Ionen."

Glucoside formation in the commoner monoses, P. A. LEVENE, A. L. RAYMOND, and R. T. DILLON (*Jour. Biol. Chem.*, 95 (1932), No. 2, pp. 699-713, figs. 3).—The glucoside formation under comparable conditions of all the commoner monoses was studied with the result that for each sugar the proportion of furanoside was found to rise to a maximum and then decrease. The time required to reach this maximum was in general different for each individual sugar, as was also the specific rates of furanoside and pyranoside formation and, usually, the ratio of the two rates.

The formation of methylglyoxal by *Clostridium acetobutylicum*, L. B. PETT and A. M. WYNNE (*Jour. Biol. Chem.*, 97 (1932), No. 1, pp. 177-182).—Methylglyoxal, isolated and identified as the bis-2, 4-dinitrophenylhydrazone, is shown to be a product of the action of dried cells of *C. acetobutylicum* upon magnesium hexosephosphate. It is suggested that the ketoaldehyde is an early transitory product of the normal metabolism of carbohydrate in this species. A preliminary indication of pyruvic acid as a further product of the fermentation of hexosephosphate by this organism is also reported.

Isolation and identification of ergosterol and mannitol from *Aspergillus fischeri*, L. M. PRUESS, W. H. PETERSON, and E. B. FRED (*Jour. Biol. Chem.*, 97 (1932), No. 2, pp. 483-489, fig. 1).—"Ergosterol and mannitol have been isolated from *A. fischeri* (Thom 5041) and *A. oryzae*, Culture 965, grown on an inorganic salt medium containing 15 percent glucose as the source of carbon, and have been identified," in this investigation of the University of Wisconsin.

The melting points and optical rotations of the free sterol, of its acetate and of its benzoate, as well as the absorption spectra of the sterol, were used to characterize the ergosterol. Mannitol was identified by means of its melting

point, by its optical rotation in borax solution, and by the melting points of its tribenzal and hexaacetyl derivatives.

A contribution to the chemistry of *Lactobacillus acidophilus*.—I, The occurrence of free, optically active, dihydroxystearic acid in the fat extracted from *L. acidophilus*, J. A. CROWDER and R. J. ANDERSON (*Jour. Biol. Chem.*, 97 (1932), No. 2, pp. 393–401).—This contribution reports the determination in the crude fat, extracted by alcohol and ether, from *L. acidophilus* of an applicable quantity of free dihydroxystearic acid, $C_{18}H_{36}O_4$.

The acid was shown to be dextrorotatory but very easily racemized. The highest observed rotation was $+7.78^\circ$, but, after the acid had been boiled with dilute alkali it was found to be optically inactive. The acid crystallizes in somewhat indistinct needles from ethyl acetate and melts at 106° to 107° . The barium salt crystallizes from 60 percent alcohol in long, silky needles and melts at 208° to 209° . Reduced with hydriodic acid, the acid was converted quantitatively into stearic acid.

A study of the fatty acids associated with the alpha amylose of corn starch, R. T. SHERMAN (*Diss., Columbia Univ., New York, 1932, pp. 39, pl. 1*).—In this investigation the fatty acids associated with corn starch were found to be hydrolyzed preferentially by acid, by base, and by a lipase-free amylase. The linking between the unsaturated portion of these acids and the carbohydrate was shown to be less stable than that between the saturated portion and the carbohydrate. The action of a lipase-free amylase separated from starch, under certain conditions, a material containing a higher percentage of fatty acid than does α -amylose and consisting of a partially hydrolyzed α -amylose from which only a small portion of the unsaturated acids had been liberated by the amylase.

Compounds of glucose and palmitic acid having the palmityl group at positions 1, 3, and 6 in the glucose molecule were synthesized, the following compounds having been prepared for the first time: 1-palmityl 2, 3, 4, 6, tetra-acetyl glucose, 6-palmityl 1, 2, 3, 4, tetra-acetyl glucose, 3-palmityl monoacetone glucose, and 3-palmityl glucose. The action of an amylase on the above-mentioned derivatives and also on α and β penta-acetyl glucose was tested.

The chemistry of the coffee-bean.—I, Concerning the unsaponifiable matter of the coffee bean oil. Preparation and properties of kahweol, R. O. BENGIS and R. J. ANDERSON (*Jour. Biol. Chem.*, 97 (1932), No. 1, pp. 99–113, figs. 3).—The authors found in the unsaponifiable fraction of the fat extracted from freshly roasted coffee a highly unsaturated, optically very active, and sensitive product designated kahweol, together with one or more sterols. The composition of kahweol corresponded approximately to the formula $C_{19}H_{26}O_3$. The substance apparently contained one hydroxyl group and it melted at 143° to 143.5° ; $[\alpha]_D^{21} = -204.5^\circ$. Catalytic reduction of kahweol gave a compound having a composition $C_{19}H_{32}O_3$ and containing two hydroxyl groups. Reduced kahweol melted at 175° ; $[\alpha]_D^{23} = -67.81^\circ$. The phytosterol isolated was found similar to sitosterol. It appeared to have the composition $C_{27}H_{45}OH.H_2O$; it melted at 138° to 139° ; and the specific optical rotation was -35.58° .

A chemical study of rancidity.—I, Autoxidation of shortenings and crackers, II, Factors influencing the keeping quality of shortenings and crackers, H. O. TRIEBOLD and C. H. BAILEY (*Cereal Chem.*, 9 (1932), Nos. 1, pp. 50–64, figs. 3; 2, pp. 91–106, fig. 1; abs. in *Minnesota Sta. Rpt. 1932, p. 20*).—Of these two contributions from the Minnesota Experiment Station the first reports upon the adaptation of methods for controlled oxidation experiments to the study of the behavior of crackers at 90° C., the length of the induction period in the cases of the various shortenings used in the manufacture of crackers and the

rate of oxygen absorption by these substances being included among the data recorded.

"Keeping quality of crackers was found to be generally related to the length of induction period of the shortenings used in them, but several outstanding exceptions to this relationship were noted. The coefficient of rank of correlation found for series 1 was $+0.504 \pm 0.109$, and for series 2 it was $+0.805 \pm 0.071$. Keeping quality of crackers was found to be more closely related to the length of induction period of the crackers themselves. The coefficient of rank of correlation found was $+0.979 \pm 0.008$."

From the tests described in the second paper it was learned that exclusion of air was much more effective in lessening the tendency of shortenings to become rancid than was refrigeration (10° C.), but crackers stored in carbon dioxide became rancid as rapidly as did those stored in air. Dry air appeared to increase the tendency of the crackers to deteriorate by oxidation, whereas a humidity of 1 percent or more appeared protective.

Reheating crackers for 5-minute intervals at 400° F. for crisping was found markedly to accelerate their oxidative deterioration.

Iodine numbers of shortenings did not appear related to keeping qualities. Free fatty acid content and to a greater extent the smoking temperatures of shortenings were distinctly correlated with keeping qualities. Coefficients of rank of correlation for these factors are given. No relationship was found between the keeping quality of commercial crackers and their H-ion concentration.

Relationships between the structure of organic compounds and their inhibiting effect upon liver esterase. Resemblance to a lyotropic series of anions. D. GLICK and C. G. KING (*Jour. Biol. Chem.*, 95 (1932), No. 2, pp. 477-482, figs. 4).—A series of compounds, in which the CN, I, NO₃, SH, Br, OH, Cl, CO, CONH₂, and NH₂ groups were attached to an amyl radical, conformed in inhibitory effect upon liver esterase to the well-known lyotropic ion series for the analogous inorganic ions in their effect upon protein dispersion in aqueous solution. When a phenyl group was substituted for the amyl group approximately the same order of activity was found. The phenyl radical produced an effect greater than that of the corresponding cyclohexyl radical. Increasing the size of the hydrocarbon ring also caused a greater inhibiting effect, as shown by cyclohexanone and cyclopentanone. Hexylresorcinol produced an inhibiting effect much greater than that of any of the other compounds studied.

The determination of vitamin A in the ether extract of wheat flours [trans. title], A. DANGOUMAU (*Compt. Rend. Soc. Biol. [Paris]*, 111 (1932), No. 38, pp. 796, 797).—From 0.5 to 1 cc of the oils obtained from wheat flour by ether extraction and evaporation under reduced pressure in an atmosphere of nitrogen sufficed as the sole source of vitamin A in curative experiments on rats. Oils prepared similarly, but which had become rancid on standing although kept in closed flasks and protected from light, were without effect.

The antineuritic vitamin.—IV, The preparation of a highly potent concentrate, R. J. BLOCK and G. R. COWGILL (*Jour. Biol. Chem.*, 98 (1932), No. 2, pp. 637-643).—In this continuation of the series of papers noted previously (E.S.R., 67, p. 647), a method is described for obtaining an active concentrate of vitamin B (B₁) by extraction from aqueous alkaline solutions by organic solvents. The method consists essentially in adjusting the H-ion concentration of an aqueous extract of the vitamin to about pH 10 with any common alkali, extracting the solution with an organic solvent immiscible in water, and removing the vitamin from the solvent by treatment with acid. A

description is given of a typical experiment, starting with an aqueous extract of rice polishings and using dry K_2CO_3 to adjust the alkalinity to pH 10, extracting the ice cold alkaline solution with ether at a temperature below $5^\circ C.$, and collecting the extracted vitamin in acid.

The yields are said to be proportional to the amount of organic solvent used per pigeon unit present in the starting material. Possible losses are alkaline destruction, which is decreased at low temperature; oxidation, which is prevented by the use of great care in removing the ether from the acidified concentrate; and mechanical losses. In the authors' experience vitamin B concentrates have been obtained directly from rice polishings or yeast which approximate in potency the concentrates obtained by the Jansen-Donath method up to and including the platinum stage, with yields of approximately 90 percent as compared with about 5 percent for the more elaborate procedure.

Irradiation of nucleic acids and uracil, F. F. HEYROTH and J. R. LOOFBOUROW (*Nature [London]*, 131 (1933), No. 3299, pp. 92, 93).—It is noted briefly that irradiation experiments with nucleic acids and uracil similar to those reported by Guha and Chakravorty (E.S.R., 68, p. 725) for adenine sulfate have given negative results with respect to the vitamin B_1 potency of the irradiated product. Attention is called to the finding of sulfur in the vitamin B_1 molecule, as reported by Windaus (E.S.R., 67, p. 101) and Kinnersley et al. (E.S.R., 68, p. 725). The authors are of the opinion that it is unlikely not only that any sulfur-free base can yield vitamin B_1 upon irradiation, but also that sulfur can be introduced as an integral part of the molecule from the sulfuric acid bound by the base.

"Aside from these arguments, it is possible that if adenine is the only precursor of vitamin B_1 in the nucleic acids, one might fail to find activity upon irradiating nucleic acids, but succeed in finding it upon irradiating adenine sulfate, either because of the higher concentration of the material capable of activation in adenine sulfate solutions or because the chemical binding of adenine to other constituents might prevent its activation when a part of the nucleic acid molecule."

Hexuronic (ascorbic) acid as the antiscorbutic factor, and its chemical determination (*Nature [London]*, 131 (1933), No. 3304, pp. 273, 274, fig. 1).—This communication includes a summary by T. W. Birch, L. J. Harris, and S. N. Ray of evidence pointing to the identity of vitamin C and hexuronic acid (ascorbic acid), comparative values as determined by chemical and biological tests of the antiscorbutic potency of various foods, and the antiscorbutic activity of hexuronic acid; together with a brief note by Dann dealing with the contention of Zilva (E.S.R., 69, p. 9) of lack of parallelism between the antiscorbutic activity and reducing capacity of vitamin C-containing materials.

The microchemical method used in estimating the hexuronic acid (and presumably the vitamin C) content of foods involved preliminary extraction with trichloroacetic acid and titration against 2,6-dichlorophenolindophenol in acid solution. "Certain naturally occurring reducing reagents, which were found to react when the reducing capacity of foodstuffs was determined according to the Tillmans technic in more neutral solution, did not interfere by this method (special precautions, however, being necessary in the presence of adrenaline). Sensitivity is about 1 part in 30. An amount of vitamin C represented by 0.03 cc of orange juice suffices for an accurate assay, and the determination requires only a few minutes to carry out." The figures thus obtained showed close agreement with the vitamin C value expressed as minimal protective day doses for guinea pigs.

As determined by curative, tooth structure, and preventive methods, 1 cc of orange juice was found to be equivalent to 0.5 ± 0.15 mg of hexuronic acid. The authors recommend the adoption of hexuronic acid as an international standard for vitamin C.

Vitamin C [trans. title], F. MICHEEL (*Naturwissenschaften*, 21 (1933), No. 4, p. 63).—Certain chemical reactions of vitamin C are summarized, leading to the conclusion that the vitamin is either a furan or a cyclopentane derivative.

Constitution of vitamin C, F. MICHEEL and K. KRAFT (*Nature* [London], 131 (1933), No. 3304, pp. 274, 275).—In this note further evidence is summarized, leading to the conclusion that of the two molecular arrangements proposed for vitamin C, as noted above, the furan type conforms most closely to established properties. Structural formulas are given for the vitamin, its enol form, and certain derivatives.

Diffusible serum calcium by high pressure ultrafiltration, H. O. NICHOLAS (*Jour. Biol. Chem.*, 97 (1932), No. 2, pp. 457–464, fig. 1).—A small form of a high pressure ultrafilter with a specified commercial type of cellophane as a membrane and its application to the determination of diffusible serum calcium is described: "With this apparatus the concentration of normal diffusible calcium is somewhat higher than those values obtained by low-pressure methods, but more constant. The normal values obtained by this method show 64 percent of the serum calcium to be diffusible, with the remaining 34 percent firmly and strongly held by the proteins." The author believes his cellophane membranes better than collodion sacs.

The rate of autoxidation of oxidation-reduction systems and its relation to their free energy, E. S. G. BARRON (*Jour. Biol. Chem.*, 97 (1932), No. 1 pp. 287–302, figs. 7).—When the autoxidation by molecular oxygen of a number of reversible oxidation-reduction dyes was examined electrometrically, it was found that at a constant pH value and in the absence of catalysts there is a linear relation between the E' of the dye and the logarithm of the time necessary to oxidize the dye from 2 percent to 50 percent oxidation. This, however, "is not a general rule, as 1-naphthol-2-sulfonate-endo-2,6-dichlorophenol is oxidized at greater speed. On the other hand, hydroquinone is oxidized at lower speed than predicted if the rule was general."

Further conclusions are that "when the E' of the system is changed by changing the pH of the solvent, the same relation between E' and speed of oxidation has been found. When the rate of oxidation of single oxidation-reduction systems is studied, the identical relation exists between the oxidation potential of the system and the rate of oxidation. In such a case even those systems which did not oxidize at the predicted time show this relationship. The rate of oxidation of some of the dyes can be expressed by the equation of reactions of the first order."

The significance of these findings, with their "supposed contradiction to well-known thermodynamic assumptions" is discussed.

Quantitative organic microanalysis, F. PREGL, trans. by E. FYLEMAN (*London: J. & A. Churchill*, 1930, 2 ed., pp. XIV+237, figs. 51).—This second translation (from the third German edition) differs little in plan from the second German and first English editions (E.S.R., 53, p. 714), but many of the chapters have been enlarged and many references to the voluminous recent contributions on microanalytical procedures have been added as footnotes.

A method for the micro gravimetric determination of silica in tissue, J. C. MORGAN and E. J. KING (*Jour. Biol. Chem.*, 95 (1932), No. 2, pp. 613–620, figs. 2).—The authors describe in detail a micro method capable of determining silicon dioxide to 0.01 mg, the procedure being dependent in part on the micro-

chemical procedures developed by Pregl, as noted on page 170, and involving the ashing of the material and volatilization of the silicon dioxide with hydrofluoric acid.

Manometric analysis of gas mixtures, I-VI (*Jour. Biol. Chem.*, 95 (1932), No. 2, pp. 509-611, figs. 5).—These six papers report upon various applications and modifications of the manometric apparatus and method of Van Slyke and Neill, noted on page 172.

I. *The determination, by simple absorption, of carbon dioxide, oxygen, and nitrogen in mixtures of these gases*, D. D. Van Slyke and J. Sendroy, Jr. (pp. 509-529).—Using this manometric apparatus, the gas sample and the nitrogen are measured by the pressures they exert at defined volumes. The carbon dioxide and oxygen are absorbed in alkali and in hyposulfite solution, respectively, in the chamber of the apparatus, the resultant decreases in pressure being noted.

II. *Carbon dioxide by the isolation method*, D. D. Van Slyke, J. Sendroy, Jr., and S. H. Liu (pp. 531-546).—Carbon dioxide was isolated from other gases by shaking the gas mixtures in any desired volume with alkali solution in the chamber of the apparatus. The other gases having been ejected, the carbon dioxide absorbed was set free with acid and determined as in estimations of plasma carbon dioxide content.

“The method is especially adapted to accurate determination of CO_2 when the latter is present in minimal proportions, as in atmospheric air, in which the carbon dioxide content can be estimated easily within 0.0003 volume percent. In respired air the method gives results exact to within ± 0.05 volume percent.”

III. *Manometric determination of carbon dioxide tension and pH of blood*, D. D. Van Slyke, J. Sendroy, Jr., and S. H. Liu (pp. 547-568).—“The CO_2 tension is obtained by equilibrating blood with $\frac{1}{3}$ its volume of a gas mixture which contains CO_2 and O_2 in tensions approximating those of average venous or arterial blood. The gas bubble attains the CO_2 tension of the blood, which is then determined by micro gas analysis of the bubble with the method described in the preceding paper. The pH of the plasma is calculated by the Henderson-Hasselbalch equation from the CO_2 tension found in the blood and the CO_2 content determined by analysis of subsequently separated plasma. The maximum errors are ± 2.5 mm of CO_2 tension and ± 0.04 pH ; the usual errors are less.”

With one sample of blood and an entirely gasometric technic, these determinations give the acid-base balance of the plasma in terms of pH , carbon dioxide or bicarbonate content, and carbon dioxide tension.

IV. *Hydrogen and oxygen by combustion*, D. D. Van Slyke and M. E. Hanke (pp. 569-585).—Report is made upon methods for the determination of hydrogen and oxygen in gas mixtures by the combustion procedure, the gases before and after ignition being measured by pressure. The apparatus was found applicable for micro determinations with 1.5-cc samples of gas, or for macro analyses with samples of 30 to 35 cc. By reducing the pressure in the combustion chamber even the most explosive mixtures could be burned smoothly. Dilution with inert gas as in the usual methods was not necessary.

The maximum error in micro determinations was about ± 0.2 percent of the total gas. In macro determinations of hydrogen the maximum error was ± 0.05 percent, and in oxygen determinations ± 0.03 percent of the total gas.

V. *Hydrogen by absorption with Paal's picrate-palladium solution*, D. D. Van Slyke and M. E. Hanke (pp. 587-597).—The quantitative estimation of hydrogen in gas mixtures by absorption with a colloidal palladium-sodium picrate solu-

tion is described. A complete analysis could be performed in 20 minutes, and with samples of 1.5 cc the maximum error was shown to be 0.2 percent of the total gas.

VI. *Carbon monoxide by absorption with blood*, J. Sendroy, Jr. (pp. 599–611).—A method for the analysis of air containing carbon monoxide in concentration from 0.05 to 0.3 percent is described. The carbon monoxide was first combined, in the chamber of the apparatus, with the hemoglobin of completely reduced blood, and the carbon monoxide content of the blood was then determined by the method of Sendroy and Liu, noted below.

The determination of gases in blood and other solutions by vacuum extraction and manometric measurement, I, II (*Jour. Biol. Chem.*, 61 (1924), No. 2, pp. 523–584, figs. 10).—Of these two papers the first, by D. D. Van Slyke and J. M. Neill, deals with principles of construction and use of the manometric apparatus, the details of apparatus, the details of general technic, calculation, the determination of carbon dioxide in blood or plasma, the determination of plasma carbon dioxide capacity, the determination of oxygen in blood, the combined determination of oxygen and carbon dioxide in blood, the determination of carbon monoxide in blood, the combined determination of carbon dioxide, oxygen, and carbon monoxide, micro analyses, the determination of gases in liquids saturated at high tensions, the determination of dissolved gases in water, and the use of the apparatus for air and general gas analysis. The second, by C. R. Harington and Van Slyke, takes up a modified form of the extraction chamber used with the manometric apparatus to permit the removal of successively added reagents before each gas measurement, together with a technic for determining with the apparatus CO_2 , O_2 , CO , and N_2 , either separately or all in one sample of blood. The reabsorption corrections for CO_2 and CO are eliminated. The accuracy of the oxygen determination was demonstrated by simultaneous gasometric and titrimetric analyses of solutions of hydrogen peroxide.

Gasometric determination of oxygen and carbon monoxide in blood, J. SENDROY, JR., and S. H. LIU (*Jour. Biol. Chem.*, 89 (1930), No. 1, pp. 133–152, fig. 1).—An improved technic for the determination of oxygen and carbon monoxide in a single blood sample by the use of the Van Slyke-Neill manometric apparatus noted above is detailed. It is noted that “apparently, for the mixtures here used, 1-cc and 2-cc samples give results agreeing within the limit of error of the method.”

The determination of blood glutathione, G. E. WOODWARD and E. G. FRY (*Jour. Biol. Chem.*, 97 (1932), No. 2, pp. 465–482).—Experiments are reported showing that slightly acid tungstic acid blood filtrates are unsuitable for blood glutathione determinations because of the rapid loss of sulfhydryl by autoxidation.

The method for the determination of blood glutathione here described depends upon the preparation of a sulfosalicylic acid blood filtrate and the estimation of the glutathione in this filtrate by titration with 0.001 N potassium iodate. Reduced glutathione values, in a series of 30 normal individuals, were found to cover the range 25 to 41 mg per 100 cc of blood, with an average at 34 mg; in 5 cancer cases, values of 26 to 36 mg were found.

“Zinc reduction of the filtrate gives an increase in this value of 3 to 11 mg, which is assumed to be oxidized glutathione. The only known blood constituent found to interfere in the method was thioneine. This is estimated to produce an error of about 3 mg in the glutathione values.”

The determination of ammonia in blood and other biological fluids, O. FOLIN (*Jour. Biol. Chem.*, 97 (1932), No 1, pp. 141–154, fig. 1).—Various

improvements in details of the aeration method are described, also a new form of absorption tube, so designed as to insure the absorption of the ammonia content of the aeration current. Aeration by passing the air current over a thin layer of the blood sample, rather than through a relatively deep column of the sample, is recommended as a means of avoiding foaming. The question of which alkali should be used to liberate the ammonia content of the blood sample is discussed, borates in any concentration being held to be inferior to carbonates. The value of very small quantities of gum ghatti in preventing cloudiness or turbidity in the use of the Nessler determination of ammonia is emphasized. The preparation of reagents and the working detail of the author's present procedure are given, and the "accuracy and validity of many of the blood ammonia values reported" is brought into question, 30-minute periods of aeration having been shown to be of doubtful effectiveness. The author aerates for from 40 to 45 minutes.

A micro method for the determination of very small quantities of magnesium in biological material [trans. title], K. LANG (*Biochem. Ztschr.*, 253 (1932), No. 1-3, pp. 215-217).—Noting the very low concentrations in which magnesium occurs in many biological materials, together with the fact that magnesium ammonium phosphate has a solubility of about 1:60,000, the hydroxyquinoline derivative of about 1:300,000, the author gives as the basis of his new micro method the solubility of about 1:10,000,000 of the magnesium salt of the ditropaeolin 00. Proteins were found to interfere with the determination, and calcium had also to be removed since it was found to form a very slightly soluble tropaeolin 00 salt. The calcium compound was found more soluble than the magnesium tropaeolate, however.

To carry out the determination of magnesium by tropaeolin 00 precipitation in the case of blood serum, 2 cc of the serum were diluted with 1 cc of the water and 1 cc of saturated ammonium oxalate solution was added. The precipitated calcium oxalate was centrifuged off after 1 hour, 3 cc of the supernatant solution were pipetted into a 10-cc volumetric flask, 2 cc each of 10 percent sodium tungstate and of $\frac{2}{3}$ N sulfuric acid were added, and the volume was completed with water. After filtering or centrifuging, 4 cc of the solution were pipetted into a centrifuged tube of about 10-cc capacity, which was placed in a boiling water bath. To the hot solution were now added 2 cc of a freshly filtered, saturated solution of tropaeolin 00, and the tube was cooled in ice water, thereby precipitating the magnesium tropaeolin compound in crystalline form. The precipitate, after standing 1 hour, was washed at the centrifuge with 4-cc portions of water until the washed water was only straw-colored.

The precipitate was then dissolved in the centrifuge tube in 4 cc of concentrated sulfuric acid, washed quantitatively into a 50-cc volumetric flask, made up to the mark, and colorimetrically or photometrically compared with a similarly prepared standard.

It is noted that a precipitation of magnesium by tropaeolin 00 constitutes a suitable basis also for a larger scale, gravimetric determination. In this case the precipitate is washed, dried at 105° C., and weighed, each 30 mg of the precipitate having been found to contain 1 mg of magnesium.

Determination of iron in cow's milk and human milk, F. REIS and H. H. CHAKMAKJIAN (*Jour. Biol. Chem.*, 98 (1932), No. 1, pp. 237-240).—This method is an adaptation of the authors' procedure involving the colorimetric estimation of ferric ferrocyanide held in dispersion by the use of gum ghatti as a protective colloid, already described (*E.S.R.*, 67, p. 105). The adaptation includes a specific procedure for the complete oxidation of the organic con-

stituents of the milk samples by sulfuric acid digestion with the aid of additions of potassium chlorate solution. The adapted colorimetric procedure is also detailed, and a change in the type of digestion tube is prescribed. Five-cc samples are shown to have permitted accurate results.

Having obtained a sample of milk from four cows milked directly into a bottle, the authors found that its analysis seemed to justify the suspicion that a small part of the iron in milk owes its presence to rusty cans. The results of titration with titanium chloride are shown by the data submitted to have paralleled closely those of the more rapid and more convenient colorimetry.

An iodometric method for the determination of certain of the purines and their derivatives [trans. title], M. Z. GRYNBERG (*Biochem. Ztschr.*, 253 (1932), No. 1-3, pp. 143-145).—By adding 0.1 N iodine in a quantity 2 or 3 times that expected to be reduced, followed by an equal quantity of 0.1 N sodium hydroxide, allowing the reaction from 10 to 15 minutes for completion, acidifying with 5 percent sulfuric acid, and titrating the excess iodine with 0.1 N thiosulfate, the author obtained accurate determinations of guanine, xanthine, and uric acid. Neither adenine nor hypoxanthine gave this reaction. In the cases of guanine and xanthine, two molecules of iodine were found to react with one of the purine. In the case of uric acid, one molecule of iodine reacted with one of the purine compound.

The determination of sugars in plant extracts, T. G. PHILLIPS (*Jour. Biol. Chem.*, 95 (1932), No. 2, pp. 735-742).—In a contribution from the New Hampshire Experiment Station the author presents the results of a critical comparison of the Fehling, Shaffer-Hartmann, and Tompsett reagents with an improved form of alkaline copper solution containing bicarbonate and made less strongly alkaline than the three reagents previously named.

"No one of the four oxidizing reagents is best for all the plant extracts used. As far as the materials studied are indicative, it appears that a choice may be made by comparing Fehling's solution and the bicarbonate reagent. Comparison with the Shaffer-Hartmann reagent is suggested, as because of its convenience it is preferred for use with extracts to which it can be applied. As used in this study, Fehling's solution is not reliable for the determination of amounts of glucose less than 5 mg. It may be used to determine as little as 2 mg of sucrose in the presence of 5 mg or more of glucose. The calculations of sucrose determined in the presence of reducing sugars must be made in a manner suited to the peculiarities of the oxidizing reagent used."

The copper reduction values of mannose under certain fixed conditions, P. H. MOORE, R. W. LLOYD, and G. E. BURGET (*Jour. Biol. Chem.*, 97 (1932), No. 2, pp. 345-350).—Finding that, in attempts to determine mannose in intestinal contents, the low specific rotation of the sugar made optical methods unreliable while a number of the standard copper reduction methods were subject to interference by protein precipitated with the cuprous oxide, the authors developed a method of which the working detail is given. It is based on the reduction of Benedict's solution under specifically prescribed conditions, the reduction being followed by an electrolytic determination of the reduced copper precipitated. The paper includes a table of cuprous oxide and copper equivalents of mannose in single milligrams of mannose from 10 to 30 mg.

For mannose in pure solution the method was shown to be accurate to within 0.1 percent. The conditions for the accurate use of the method for the physiological work for which it was designed are specified in detail.

The colorimetric determination of phosphorus in citric acid extracts of soils, R. R. WARD (*Soil Sci.*, 35 (1933), No. 2, pp. 85-97, figs. 4).—The author treated 100-ml aliquots of his citric acid extracts each with 50 ml of concen-

trated nitric acid, 15 ml of concentrated hydrochloric acid, and 10 ml of 20 percent phosphorus- and arsenic-free sulfuric acid, finding these reagents adequate, on evaporation to fuming under specified conditions, to destroy all citric acid, as well as organic matter from the soil, in extracts of Hawaiian soils; but it is noted that soils carrying more organic matter may require further additions. Iron was found to be most readily eliminated by electrolysis in a cell provided with a mercury cathode. It was found that separation of most of the silica by dehydration with hot fuming sulfuric acid was a great deal more satisfactory than evaporation to dryness with hydrochloric acid and baking; enough of the silica being eliminated to prevent interference. "In the latter method the large amount of titanium present in Hawaiian soils precipitates a considerable amount of phosphorus which will not redissolve in hydrochloric acid, and for accurate work the residue must be fused with sodium carbonate in order to recover the phosphorus." At the close of the evaporation the sulfuric acid could not be allowed to fume vigorously or at a high temperature by reason of the danger of a loss of phosphoric acid. The mercury required to be drained from the cells during electrolysis, or immediately thereafter, to prevent resolution of iron. The color was best developed at the same time in the standard and in the unknown solutions. It was observed also that "blanks should be run frequently, preferably with the addition of a known amount of standard phosphate solution just before developing the color, in order to reduce errors due to deviations from Beer's law at the low concentration of the blank."

AGRICULTURAL METEOROLOGY

The weather: Is it caused or does it happen? M. R. ENSIGN (*Ga.-Fla. Pecan Growers Assoc. Proc.*, 1932, pp. 36, 37).—A periodogram analysis of temperature and barometric pressure over periods of 80 to 120 years in the United States, Italy, and South Africa indicated periodicities of 3, 4, 8, 12, 16, 18, and 29½ years. It is stated that "long range weather forecasts based upon the [periodicity relationships] made from 30 to 60 days in advance for Florida and the Southeastern States, in the past 4 years, have been realized to a high degree."

Sunspots, planets, and weather (*Nature* [London], 130 (1932), No. 3270, pp. 31, 32).—This is an advance review of the presidential address by I. Jones, director of the Bureau of Seasonal Forecasting in Queensland, to the Queensland Astronomical Society, in which "he seeks for the explanation of abnormal weather not only in the sun spots themselves but also in the conjunctions of the planets [Jupiter, Saturn, Uranus, and Neptune]. Especially important is the conjunction of all four, which occurs at intervals of 164 years and is often associated with world-wide climatic disturbance and severe famines." Although many other factors must be taken into account, a number of examples are given to support the view that in Australia at least the major control of weather is exerted by the sun.

Sunspots and the weather, H. H. CLAYTON (*Bul. Amer. Met. Soc.*, 14 (1933), No. 3, pp. 65-69, figs. 3).—This is an abstract of papers by W. B. Schostakowitsch and H. Mémery. These observers found temperature changes in the same sense as the sun spots. Both investigators found an increase of temperature with an increase of sun spots. Mémery also found a relation between rainfall and sun spots for southern France.

Long-range forecasting, C. G. ABBOT (*Science*, 77 (1933), No. 2002 p. 455).—This is an abstract of a paper presented at the annual meeting of the

National Academy of Sciences held in Washington, D.C., April 24 and 25, 1933. The paper refers to verification of past forecasts of solar variations and presents a detailed forecast of solar variation to December 1934.

Monthly Weather Review, [November–December 1932] (*U.S. Mo. Weather Rev.*, 60 (1932), Nos. 11, pp. 207–235, pls. 11, figs. 7; 12, pp. 237–270, pls. 18, figs. 8).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 11.—The Climate of the Lower Rio Grande Valley of Texas, by E. J. Foscue (pp. 207–214) (see p. 177); Aeronautical Meteorology in Germany, by E. R. Miller (pp. 214–216); Meteorological Conditions during the Formation of Ice on Aircraft, by L. T. Samuels (pp. 216, 217); The Section Director and the Cooperative Observer, by M. E. Blystone (pp. 217–219); Convenient Meteorological Records, by G. B. Wurtz (pp. 219, 220); Tree Rings and Wheat Yields in Southern Saskatchewan, by L. B. Powell (pp. 220, 221) (see p. 178); A Review of "The Structure of the Wind Over Level Country," by M. A. Giblett et al., rev. by G. Grimminger (pp. 221, 222); and The Tropical Storm of October 30–November 13, 1932, by C. L. Mitchell (p. 222).

No. 12.—Twenty-nine Months of Solar Radiation of Tucson, Ariz., by G. E. Davis and J. L. McCarthy (pp. 237–242) (see p. 177); Changes in the Solar Constant of Radiation, by F. Baur (pp. 242–246); The Change of Humidity Incident to a Thunderstorm, by W. J. Humphreys (p. 246); Weather Types of the Northeast Pacific Ocean as Related to the Weather of the North Pacific Coast, by T. R. Reed (pp. 246–252); The Remarkably Heavy Precipitation at Henderson Lake, Vancouver Island, British Columbia, by F. N. Denison (p. 252); Snow Rollers, by C. D. Reed (p. 252); West Indian Hurricanes and Other Tropical Cyclones of the North Atlantic Ocean by C. L. Mitchell (p. 253); Preliminary Statement of Tornadoes in the United States during 1932, by R. J. Martin (p. 253); and The Weather of 1932 in the United States, by R. J. Martin (pp. 254, 255) (see below).

The weather of 1932 in the United States, R. J. MARTIN (*U.S. Mo. Weather Rev.*, 60 (1932), No. 12, pp. 254, 255, pls. 2).—The monthly and annual departures of temperature and rainfall for 1932 are shown in tables and charts, and the general weather conditions of the year are summarized as follows:

"The year 1932 averaged slightly above normal in temperature, although it was considerably cooler than 1931. . . . March, October, and December were the months of 1932 averaging below normal. Of these, March had the greatest negative departure and was below normal in nearly every district east of the 110th meridian. January was the month with the greatest temperature variation, the departures ranging from $+12.6^{\circ}$ in the Middle Atlantic and lower Lake districts to -5.2° in the middle Plateau. Only May and August were warmer than the corresponding months of the preceding year, and in these instances the departures were less than 1° . The northern Plateau district averaged nearest the normal in temperature, the south Atlantic the warmest, and the southern Slope and middle Plateau were the only districts below the annual average.

"Precipitation was abundant in the east Gulf, Florida Peninsula, and southern Slope in 1932. The east Gulf excess was nearly 10 in., the wettest months, compared with normal, being January, September, October, and December. In contrast, the central part of the country, notably the upper Lakes, Plains States, upper Mississippi and Missouri Valleys, was dry. The greatest deficiency for the year, however, occurred in the middle Pacific district, where the total was 10 in. below the average annual fall.

"For the United States as a whole, January, June, August, October, and December were the months wetter than normal, but in no instance did the excess average more than 0.7 in. The driest months, compared with normal, were April and July. In April nearly all districts were below normal and the departures were small; in July the Atlantic coast, south of New England, and the east and west Gulf coasts had rather large negative departures, while other sections were near or somewhat above the monthly average. October was the month of greatest relative change, from -0.4 in. in 1931 to $+0.7$ in 1932. . . . The south Atlantic district was 13.5 in. wetter in 1932 than in 1931 and the east Gulf 19.5 in. The upper Mississippi and Missouri Valleys, the northern and middle Slopes, southern Plateau, and the middle and southern Pacific districts were far drier than in the preceding year; the difference in the middle Pacific region amounting to 7 in."

Climatological data for the United States by sections, [November–December 1932] (*U.S. Dept. Agr., Weather Bur. Climat. Data, 19 (1932), Nos. 11, pp. [198], pls. 3, figs. 3; 12, pp. [202], pls. 2, figs. 3*).—These numbers contain the usual brief summaries and detailed tabular statements of climatological data for each State.

Twenty-nine months of solar radiation at Tucson, Ariz., G. E. DAVIS and J. L. MCCARTHY (*U.S. Mo. Weather Rev., 60 (1932), No. 12, pp. 237–242, figs. 4*).—From a study of intensities of direct solar radiation at Tucson, Ariz., over a period of 29 months, from February 1930 to June 1932, inclusive, the author found variations which showed "very little correspondence with either sun-spot numbers, absolute humidity, air temperature, or barometric pressure, considered separately."

Meteorological observations, [January–February 1933], C. I. GUNNESS and H. JENKINS (*Massachusetts Sta. Met. Ser. Buls. 529–530 (1933), pp. 4 each*).—The usual summaries of observations at Amherst, Mass., with brief notes on the more significant features of the weather of each month.

Our climate: Maryland and Delaware, J. R. WEEKS (*Baltimore: Md. State Weather Serv., 1932, 4. ed., rev., pp. 62, figs. 33*).—This is a fourth edition of the publication previously noted (*E.S.R., 57, p. 612*).

The climate of the Lower Rio Grande Valley of Texas, E. J. FOSCUE (*U.S. Mo. Weather Rev., 60 (1932), No. 11, pp. 207–214, figs. 7*).—From a review of climatic conditions in the Lower Rio Grande Valley of Texas, more particularly in the region of Brownsville, it is shown that "the rainfall varies from more than 30 in. on the coast to about 15 in. at the upper end of the area. Most of the rain comes during the period from April to October, and the remaining part of the year is relatively dry. There is a great fluctuation in the annual rainfall, which is characteristic of the Great Plains type. A period of wet years is followed frequently by a period of very dry years. The drought hazard is so great that irrigation is necessary, particularly with the high rate of evaporation. The winds are dominantly from the Gulf of Mexico, and modify the summer temperature. The winters are quite mild, although occasional cold spells cause great damage to crops. Killing frosts may occur any year, but do not every year. Destructive storms are rare and snow seldom falls."

It is also shown that while the great range in rainfall of the region "has an effect on the natural vegetation to some extent, its significance to agriculture is not as great as might be expected, since the evaporation rate is high enough to make even 30 in. of rainfall insufficient for successful agriculture, and irrigation is practiced throughout the region where topography and soils are favorable. The average annual rainfall, while varying in distribution throughout the

region, is possibly not as significant as the variation in the annual total rainfall."

The rainfall of Malta, with a remark on long-period forecasting, R. C. SUTCLIFFE (*Met. Mag. [London]*, 67 (1932), No. 801, pp. 203-206, figs. 2).—It is shown in this article that the total annual rainfall of Malta is determined by a relatively few days (about 15 per year) of heavy rainfalls. The bearing of this fact on seasonal forecasting is indicated, the conclusion being that "seasonal forecasting is, in some cases (of which the rainfall of Malta is one definite example), not only difficult but quite impracticable."

Climate and corn yield in Indiana, 1887-1930, J. K. ROSE (*Ind. Acad. Sci. Proc.*, 47 (1931), pp. 317-321, figs. 16).—A series of diagrams is given which were prepared by a method of plotting one factor, July rainfall for example, on the abscissas and the temperature or other factor on the ordinates, locating at the meeting point of the two factors for a given year the yield of corn for that year, and placing the doubly smoothed yields on the diagram, shaded progressively lighter to represent progressively lower yields. The method is thought to have some advantages over correlation coefficients, but has the disadvantage that only two climatic factors can be considered on one diagram.

Tree rings and wheat yields in southern Saskatchewan, L. B. POWELL (*U.S. Mo. Weather Rev.*, 60 (1932), No. 11, pp. 220, 221).—From a study of radial tree growth at two points in southern Saskatchewan, by the Douglass method (*E.S.R.*, 60, p. 417) the author concludes that a relation exists between tree growth and wheat yield in that region. The only important cycle found was one of over 50 years, and he concludes that lack of short cycles makes prediction of wheat yields from tree growth impossible.

The influence of climate on German grains [trans. title], OPITZ (*Landw. Jahrb.*, 76 (1932), No. 5, pp. 697-731).—Data are reported which show the importance of taking account of climatic and regional factors in the production of grains, especially wheat, rye, and barley, in Germany.

SOILS—FERTILIZERS

[Soil investigations of the Connecticut State Experiment Station] (*Connecticut State Sta. Bul.* 347 (1933), p. 280).—A very brief statement summarizes greenhouse and laboratory work demonstrating the elimination of phosphorus as a limiting factor by the residual effect of previous heavy fertilizer treatments; rate of application experiments for the three principal nutrients; fertilizer experiments on the Windsor field; and lysimeter investigations at Windsor.

[Soil and fertilizer work of the Florida Station] (*Florida Sta. Rpt.* 1932, pp. 63-68, 187-191, 195, 196, 203).—The report discusses, in some instances in more or less detail, work by R. W. Ruprecht on concentrated fertilizers and the effect of fertilizers and soils on the composition of truck crops; the determination by R. M. Barnette of the effect of *Crotalaria* and other green manures on the composition of the soil, and the decomposition of forest, range, and pasture growths to form soil organic matter; and soil reaction studies, and the role of fertilizers and special elements in plant development on the peat and muck soils of the Everglades, by R. V. Allison.

[Soil research at the Rhode Island Experiment Station] (*Rhode Island Sta. Rpt.* [1932], pp. 44-47, 49, 50, 54, 55).—The present report concisely summarizes the work on substitution of green manures for stable manure, fertilizer requirements of crops, effect of manganese and magnesium, soil acidity and liming, crop effects on succeeding crops, soil nitrates and vegetable crops, soil nitrate levels and certain fractions of nitrogen in plant juices, the readily

available phosphate in the soil, and on availability of certain phosphatic fertilizers.

Soil survey of Franklin County, Massachusetts, W. J. LATIMER ET AL. (*U.S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1929, No. 9, pp. 45, fig. 1, map 1*).—Franklin County, with an area of 442,240 acres in northwestern Massachusetts, includes parts of the southern New England upland plateau and of the Connecticut River Valley lowland. Practically the entire county is well drained, principally by the Connecticut River and its tributaries.

The most extensive of the soils, here mapped and described in cooperation with the Massachusetts Department of Agriculture, as 26 series of 67 types, is Gloucester stony fine sandy loam, which occupies 12.5 percent of the soil area of the county. The remaining groups and types, with the exception of 28 percent of rough stony soils most valuable as forest land, are not individually extensive.

Soil survey of the Basin area, Wyoming, J. T. THORP ET AL. (*U.S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1928, No. 27, pp. 48, pl. 1, maps 2*).—The Basin area, forming part of the Big Horn Basin desert region, includes irrigated and irrigable lands bordering the Big Horn River and certain of its principal tributaries, the total acreage being 426,240. The drainage is good under natural conditions, but the under drainage must be supplemented artificially under the conditions imposed by irrigation to prevent surface alkali accumulations.

Ralston fine sandy loam leads in areal extent among the 26 types of 9 series here mapped and described, occupying 16.8 percent of the total area examined. Billings loam follows with 13.2 percent, while 20.5 percent is rough broken stony land. The survey was in cooperation with the Wyoming Experiment Station.

Evaluation of soil types of North Carolina for different crops (*North Carolina Sta. Agron. Inform. Circ. 77 (1933), pp. [1]+26*).—The soils of the State are rated by groups on a productivity scale of 10 for each of the crops most grown in the State.

Soil conservation (*Kansas Sta. Bien. Rpt. 1931-32, pp. 25-30*).—Data are reported on soil fertility as influenced by fertilizers, soil moisture, and rotations; the effect of degree of slope on run-off and erosion; the relation of calcium, phosphorus, and nitrogen in Kansas soils and second-cutting alfalfa hay; soybeans and sweetclover as soil improvement crops; the effect of various soil treatments on the growth and inoculation of alfalfa; the influence of the absolute reaction of the soil solution upon the growth and activity of *Azotobacter*; the soil solution as governed by ion concentration; and replaceable cations and anions in Kansas soils.

Lysimeter studies.—II, The movement and translocation of soil constituents in the soil profile, J. S. JOFFE (*Soil Sci., 35 (1933), No. 3, pp. 239-257, figs. 2*).—Data on the conductivity and reaction of leachings from the new type of lysimeters (*E.S.R., 68, p. 160*) at the New Jersey Experiment Stations for a period of two years showed that during the fall there is an increase in concentration of basic salts in the A_1 horizon. This influenced the conductivity, a rise occurring during October and November. A similar rise in the pH was noted. There was also a definite parallelism between the rise in conductivity and the increase in pH. There was an increase in the total quantity of total solids in the leaching of the second year in A_1 . This was accompanied by a rise in concentration of the solids. The increase in total solid appeared to be primarily of an organic nature.

The alkaline earth bases—Ca and Mg in A_1 —showed a tendency to increase in concentration toward the end of the summer and fall, attaining a maximum in

October and November. The chlorine content of the leachings showed no consistent behavior. The direction of the winds and the Cl content of the rains appeared to govern the quantity of this ion. The S content was fairly high, and it was suggested that the rapid oxidation of the organic sulfur compounds was responsible for augmentation of sulfates in the leachings. The R_2O_3 also increased in concentration during the second year, but not so much as the other mineral constituents. The SiO_2 movement followed the R_2O_3 and the $\frac{SiO_2}{R_2O_3}$ ratio varied from 1.04 to 1.92. The low ratio corresponded to an increase in pH which is in line with the findings of Mattson (E.S.R., 64, p. 418). Of the total solids which reached A_2 from A_1 only 17 percent percolated through A_2 during the first year and 8.3 percent during the second year. There was lower loss on ignition in the total solids from A_2 than from A_1 , indicating a retention of organic matter in A_2 . The concentration of the mineral constituents—Ca, Mg, Cl, S, and R_2O_3 —increased as a rule in the leachings of A_2 as compared with A_1 .

"A comparison of the constituents removed in the leachings through A_2 with those removed from the Cornell lysimeters shows that from 20 to 40 times as much, depending on the constituent, was removed from the Cornell lysimeters. Calculations made on the assets and outgo of Ca from the soil of the Cornell lysimeters show the improbability of such losses under natural conditions. The abnormal condition of the soil material in the lysimeter tanks is responsible for such striking losses. It is inferred that the old type of lysimeters is not suitable for full orientation as to what is actually going on in the soil."

Permeability of soils (*New Mexico Sta. Rpt. 1932, pp. 49-51*).—Attempts to improve the permeability and tilth of a hard impermeable clay loam by the application of acidifying materials and irrigation are briefly noted.

The relation of caliche to desert plants, F. SHREVE and T. D. MALLERY (*Soil Sci.*, 35 (1933), No. 2, pp. 99-113, pl. 1, fig. 1).—Noting the abundance in extensive areas of the southwestern United States of the "caliche" type of calcareous hardpan, of which the formation is attributed primarily to the interrupted penetration of rain water under arid conditions, with the involvement of various modifying factors in different situations, the authors of this contribution from the Desert Laboratory of the Carnegie Institute present data with regard to the moisture content both of the hard layers and of the amorphous masses in which caliche was found to occur in the area examined; with reference to the effect of the caliche layers upon moisture movement in solis; and with respect to the effect of such deposits upon root growth, especially that of the "creosote bush", *Larrea tridentata* (= *Covillea tridentata*), to which the vegetation is chiefly restricted in certain areas of caliche soils.

"The maximum water content is very low for the hard layers of caliche (3.2 to 6.5 percent) but higher for the softer masses (12.9 to 17.3 percent). Even the thinnest layers of caliche greatly retard the upward or downward movement of water in the soil. Evaporation from caliche which is underlaid by water is less than from an equal surface of a porous cup atmometer. Considerable differences of moisture content may exist in bodies of soil separated by a layer of caliche. Caliche will convey water more rapidly from soil beneath it to soil above it than it will from soil to the atmosphere."

Roots were found unable to penetrate the silicified hard layers of caliche, a condition which seriously interfered with their distribution. In cultures of *Larrea* grown in 18 types of soil, varying in texture and in percentage of soft caliche, the poorest growth was made in pure caliche; the best growth in soils containing equal amounts of caliche and sand, loam, or clay respectively,

or in these soils with lower percentage of caliche. The dry weight of the plants decreased with increasing percentages of caliche.

"The percentages of CaO in the ash of the cultured plants varied from 20.24 to 39.19 and those of MgO from 2.06 to 6.02. The varying amounts of caliche in the soils were without influence on the amounts of CaO and MgO in the ash. This result has been confirmed by data from field material taken on soils with and without surface caliche. The fact that the Ca/Mg ratio of the young cultured plants is consistently higher than that of mature plants growing in their natural habitats is due to the higher CaO, and may indicate greater drought resistance on the part of the young plants."

The chemical properties of highly calcareous soils appeared, therefore, to be of less importance than the physical in relation to the growth of *Larrea*.

On the identification of phosphate compounds in soil, S. OSUGI, S. YOSHIE, and N. NISHIGAKI (*Bul. Agr. Chem. Soc. Japan*, 7 (1931), No. 9-12, pp. 84, 85, fig. 1).—The authors found tricalcium phosphate least soluble at pH 7.68, the solubility increasing rapidly on the acid side, slightly on the alkaline. Aluminum phosphate maintained a minimum solubility between pH 4.07 and 6.93, increasing slowly in solubility with increase or decrease of pH value from the limits of this range. The minimum solubility for ferric phosphate was observed between the pH values 3 and 6, its solubility increasing markedly with increase in pH value above this range. The authors estimated the ratios between the various phosphates found in 11 soils by comparing the phosphate solubility curves with those of the pure phosphates. The experiments were considered also to indicate that such a method can be used for following the changes undergone by calcium monophosphate in a soil. A graph shows the solubility curves of the three pure phosphates determined as described.

The distribution, availability, and nature of the phosphates in certain Kentucky soils, M. C. FORD (*Jour. Amer. Soc. Agron.*, 24 (1932), No. 5, pp. 395-410).—The author examined "the distribution or localization of the native and applied phosphates in the fractions of soil separates [of] a representative soil for the purpose of ascertaining in what fraction or fractions of the soil separates the fixation of the applied phosphate occurs." He used the soils of six Kentucky experiment fields for this purpose and for that of tests of the effect of liming on the availability of phosphates, the "relatively available phosphorus" having been determined with the use of carbonated water and of 0.002 N sulfuric acid buffered at pH 3 as solvents.

"Very small amounts of relatively available phosphorus were extracted from the soils of the check plats." These quantities were roughly proportional to the total phosphorus, "which indicates that the native phosphates are essentially of one kind in these soils." Prolonged extraction of the soils gave a solubility of the native phosphates approximately equivalent to that of dufrenite. The use of lime did not seem to influence the availability of the native phosphates.

"The availability of superphosphates varies with the capacity of soils to fix phosphates in relatively insoluble and unavailable forms. On this basis, the soils studied may be divided into two groups. The first group of low capacity in this respect includes the DeKalb silt loam at Berea, the Decatur silt loam at Russellville, and the Memphis silt loam at Mayfield. The second group of high capacity in this respect includes the Tilsit silt loam at Greenville, the silt loam at Campbellsville derived from Waverly shale, and the silt loam at Fariston derived from Eastern Coal Basin shale. The use of lime reduces the rate of fixation into relatively insoluble phosphates in all of the soils, but equal applications of lime are much more effective in this respect on soils of the first group than of the second group."

The use of lime reduced the rate of solution of rock phosphate in all of the soils, more in the first than in the second of the groups above named, however. "Lime exercises a positive influence on crop response to rock phosphate on soils of the first group and a negative or neutral influence on soils of the second group. In the soils of the second group, where a high capacity exists for fixing phosphates in relatively insoluble forms, the rate of solution of rock phosphate is also high but a deficiency in readily available phosphorus exists, due to its rapid fixation as relatively insoluble and unavailable phosphates."

Some observations on base exchange in organic materials, J. F. MULLER (*Soil Sci.*, 35 (1933), No. 3, pp. 229-237).—In the work recorded in this contribution from the New Jersey Experiment Stations samples of from 1 to 5 g of various peat materials, of leaf mold, of rotted wood, of oak leaves, of bagasse, etc., were treated with 400 cc each of 0.2 N barium acetate solution, were twice leached with normal barium chloride solution, were washed chloride-free with distilled water, and were finally leached with 400 cc of normal ammonium chloride in the filtrate of which the displaced barium was determined. The base exchange properties of various similar materials after hydrolysis either with sulfuric acid 80 percent or concentrated, or with 10 percent sodium hydroxide solution, and after oxidation either with chlorine in a postassium chlorate-hydrochloric acid solution or with an alkaline solution of potassium permanganate were determined. Several of these natural organic materials were shown to have considerable base exchange capacities. Decomposition by natural processes increased the base exchange in straw and manure. The base exchange of several organic materials was markedly altered by chemical treatments.

"It is concluded that under the present methods of drastic chemical treatments required for the isolation of the various fractions of organic materials, the property of base exchange should be assigned to certain groups, such as hydroxyl or carboxyl, rather than to specific chemical substances."

Influence of organic matter on crop yield and on carbon-nitrogen ratio and nitrate formation in the soil, A. W. BLAIR and A. L. PRINCE (*Soil Sci.*, 35 (1933), No. 3, pp. 209-219, pl. 1).—At the New Jersey Experiment Stations legume and nonlegume crops were grown in Sassafras loam in cylinders without added organic matter and with rye straw, cut fine, varying in quantity from 1 to 8 tons an acre. Complete fertilizers were used for most of the work, though in certain series nitrogen was entirely omitted and in others extra quantities of nitrogen in the form of nitrate of soda were used.

With the larger applications of rye straw the yields of nonlegume crops were frequently less than the yields on check cylinders. This depressed yield with heavy applications of straw did not occur when legume crops were grown. Likewise there was little or no depression when extra applications of nitrate of soda were made. When no rye straw was used, however, larger yields were obtained in certain cases from those cylinders which had received the heavy application of straw the previous year than from the check cylinders, thus showing that the injurious effect of the straw was temporary rather than permanent.

The rye straw had little influence on the percentage of nitrogen in the crop; determinations made on samples of soil showed a gradual increase in total nitrogen, organic carbon, and organic matter as the amount of organic matter applied was increased.

"With certain exceptions the carbon-nitrogen ratio was not greatly influenced by the 1- and 2-ton applications of straw, but with 4 and 8 tons to the acre a wider carbon-nitrogen ratio was found. The heavy applications of nitrate of

soda have tended to keep the soil reaction near the neutral point. Where no nitrate was used the soil is gradually becoming more acid. Nitrate determinations made at intervals during the period indicate that an abundance of organic matter may depress nitrate formation."

Influence of rye and oat straws upon the growth and yield of certain vegetables, B. E. GILBERT and F. R. PEMBER (*Soil Sci.*, 35 (1933), No. 2, pp. 115-122).—This contribution from the Rhode Island Experiment Station presents new evidence showing the inhibitory effect of large quantities of poorly decayed organic matter upon plant growth. By the use of rye and oat straws of different composition and stage of decomposition and at various rates of application, the effects of these sources of organic matter in connection with the growth of lettuce, celery, beets, carrots, onions, and spinach were evaluated. The pot tests indicated that such resistant organic matter sources have doubtful value as substitutes for stable manure, this being true especially when the nitrogen content of the straws is very low; and that, although it may be possible to balance the inhibitory effect which accompanies the decomposition of low nitrogen straws by very large applications of nitrogen, these are of necessity so large as to be out of reason for field practice.

Relation between carbon dioxide and elemental nitrogen assimilation in leguminous plants, P. W. WILSON, E. B. FRED, and M. R. SALMON (*Soil Sci.*, 35 (1933), No. 2, pp. 145-165).—The authors of this contribution from the Wisconsin Experiment Station report experiments on inoculated clover plants grown on agar and in sand in a closed system and provided with atmospheres which contained 0.03, 0.1, 0.2, 0.4, and 0.8 percent carbon dioxide. In general, as the carbon dioxide concentration in the atmosphere was increased the leaf area, length of tops, stockiness of plant, excess of carbohydrate, and number of nodules formed were increased. Raising the carbon dioxide content of the atmosphere from 0.03 (air) to 0.1 percent resulted in a pronounced improvement in the growth characteristics named, but further increments in the carbon dioxide concentration did not induce correspondingly greater development.

Clover plants grown in agar and supplied with atmospheres containing 0.1 percent or more carbon dioxide showed an increase both in the dry weight and in the quantity of nitrogen fixed, when compared with the controls supplied only with air. However, the gain in nitrogen was relatively less than that in dry weight, and this difference caused the plants receiving additional carbon dioxide to have a lower percentage of nitrogen than the controls. When the plants were grown in sand, the lag in nitrogen fixation as compared with carbon assimilation did not occur until the carbon dioxide content of the atmosphere had been raised to about 0.4 percent. "The difference between plants in agar and in sand, when furnished with small increments of CO₂, is believed to be related to the lower rate of gas exchange of the roots of plants in agar."

Changes in soil biochemical processes under the influence of clover culture [trans. title], N. N. SUSHKINOÏ (SUSHKINA) (*Izv. Akad. Nauk S.S.S.R. (Bul. Acad. Sci. U.R.S.S.)*, 7. ser., 1931, No. 9, pp. 1219-1253, figs. 4; *Eng. abs.*, pp. 1252, 1253).—The Nosovka chernozem soils on which were carried out the experiments reported in this paper are described as formerly saline, though now desalinized lands, showing a very low productivity which appears due to an accumulation of toxic, incompletely oxidized compounds; the soils being also impoverished with respect to bacterial microflora. By the introduction of clover into the rotation grown on such soils, productivity was much improved and the biochemical soil processes were apparently restored to their normal course. The physical properties of the soil were improved, microbiological

activity and plant growth were accelerated, and yields correspondingly increased.

The effect of lime on the growth and activity of soil micro-organisms [trans. title], J. C. BLES (*Landbouwk. Tijdschr. [Amsterdam]*, 44 (1932), No. 535, pp. 448-455).—A brief general introductory statement is followed by short sections summarizing and commenting upon the more important work thus far placed on record as to the effect of lime on the protozoa, the fungi, and the bacteria of the soil (including the formation of ammonia).

Fungi isolation from Manitoba soil by the plate method, G. R. BISBY, N. JAMES, and M. TIMONIN (*Canad. Jour. Res.*, 8 (1933), No. 3, pp. 253-275, figs. 2).—The authors examined the fungus flora of 75 surface soils sampled in various parts of Manitoba, finding, in part, that "the population of fungi in these soils is abundant and varied despite climatic conditions which might appear unfavorable. Forty-four genera and 100 species of fungi have been identified and the relative frequency of each determined. It has been found that the methods of soil microbiology give data regarding the parasitic as well as the saprophytic fungi in soils; that *Trichoderma lignorum* parasitizes certain other fungi, and thus may play a part in keeping in check the pathogenic fungi within a soil; and that the addition of chemical fertilizer to a soil results in a prompt and consistent increase in the fungus flora."

Movement of fertilizers in Carrington loam, O. E. OVERSETH (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 3, pp. 202-216).—The author of this contribution from the Iowa Experiment Station determined the total loss of weight and the extent of the leaching out of individual constituents of samples of 16 percent superphosphate, of 3-12-3 complete fertilizer, and, in a part of the work, of fertilizers of various formulas, by weighing out the fertilizers in double cheese-cloth bags, placing these packages in soil under controlled temperature and moisture conditions in a greenhouse, reweighing and analyzing the contents of the packages at various intervals. The extent of the distribution through the soil and the concentration at various distances from the point of application were also considered.

Ammonium sulfate moved out of the complete fertilizer mixtures rapidly. The movement of phosphorus was rapid during the first two days in the soil and then was noticeably retarded. The movement of potassium was not quite as rapid as the movement of nitrogen. Ammonium sulfate apparently reduced the movement of phosphorus out of the phosphate, but did not show any effect on the movement of potassium. Neither did potassium chloride appear to influence the movement of phosphorus or nitrogen. The rate of movement of nitrogen in the soil was less and slower under fertilizers high in phosphorus content. The lateral movement was influenced to about the same extent. The movement of phosphorus in the soil was increased by the greater amount of nitrogen present in the complete fertilizer as sulfate of ammonia. The presence both of ammonium sulfate and potassium chloride apparently facilitated the movement of phosphorus in the soil.

"The change in the phosphate in the complete fertilizer placed in the soil appeared to be rather sudden. Indications from the data presented are that monocalcium phosphate did not remain long in the complete fertilizer in that form. The first reaction that took place was the solution and outward movement of the readily soluble monocalcium phosphate. The remaining monocalcium phosphate then formed dicalcium phosphate, a reversion taking place within the fertilizer sample immediately after moisture from the surrounding soil had diffused into the fertilizer. After a 21-day period, chemical analyses showed that about 80 percent of the phosphorus in the complete fertilizer was

in the dicalcium phosphate form. A large part of the remaining phosphorus was present as tricalcium phosphate. . . .

"The effect of the movement of soluble salts in the 4-16-4 fertilizer on the conductance of an electrical current was noticeable between the first pair of electrodes located 1 in. directly below the fertilizer. A significant decrease in resistance that continued throughout the experiment indicated constant salt movement in the soil between these electrodes. The diffusion of soluble salts in the immediate vicinity of the fertilizer zone was noted within the short time of 2 hours after the fertilizer was placed in the soil. At the 2- and 3-in. depth the soluble salt diffusion due to the movement of soil moisture was not significant even at the end of 150 hours."

The degree of humification in manures measured by the use of hydrogen peroxide, J. G. SHRIKHANDE (*Soil Sci.*, 35 (1933), No. 3, pp. 221-228).—At the Rothamsted Experimental Station little difference was found between 3 percent and 6 percent solutions of hydrogen peroxide with respect to their action upon artificial manures. Such solutions attack undecomposed straw to some extent.

In comparing the action of peroxide and water on straw and manures of different origin it was found that (1) the effect of peroxide is more than a solvent action such as is the case with water, (2) the water extract contains more organic matter than the peroxide extract, (3) water appears to extract more inorganic substance than peroxide, and (4) the amount of organic matter in the peroxide treatments is generally constant whereas that in the water shows greater variation.

Artificial manures could be arranged in order of rotting according to the figure for apparent degree of humification derived from loss in weight due to extraction with H_2O_2 . Higher initial moisture content in a series of artificial manures resulted in a greater degree of humification. In a series of artificial manures made from straw and various sources of nitrogen the degree of humification could be arranged in the order proceeding from the highest to the lowest: $\{NaNO_3 \text{ and } (NH_4)_2CO_3\}$, casein, peptone, urea, $(NH_4)_2SO_4$.

A review of researches on nitrogen fertilization in relation to economic crop production, with special reference to future investigations, W. P. KELLEY (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 1, pp. 51-64).—This contribution from the University of California reviews United States and foreign work on the effect of nitrogen on crop yields, effect of nitrogen on the quality of the crop, the relation of nitrogen to other elements, effect of different nitrogen fertilizers, effect of nitrogen on legumes, chemical and physical effects of nitrogen fertilizers, and nitrogen gains and losses from soils. A summary presents some general conclusions drawn from the conspectus.

Experiments on the use of aqueous solutions of ammonia as a nitrogenous fertilizer [trans. title], S. DOLDI (*Ann. Tec. Agr.*, 6 (1933), No. 2, I, pp. 146-161).—Aqueous ammonia solution was found a cheaper source of nitrogen in the conditions prevailing where the experiments here reported were carried out than the solid nitrogen compounds, and when applied to neutral soils in pot tests it gave dry matter yields superior to those obtained by treatment either with ammonium sulfate or with sodium nitrate. The yields were less in acid soils, however. The nitrogen content of the plants grown on neutral soils was the same in the case of each of the three sources of nitrogen. Of the plants grown on acid soils those given the ammonia solution contained twice as much nitrogen as those provided with nitrogen either from ammonium sulfate or from sodium nitrate. The ash content of the plants varied independently of the source of the nitrogen. The composition of the ash was variable, being most affected by the nature of the soil. The sulfur content

of the ash was greater in the case of the plants grown in soil treated with ammonium sulfate but was not otherwise affected by the nature of the source of nitrogen. Solutions either of ammonia or of sodium nitrate had no effect upon the reaction of a soil bearing vegetation, but ammonium sulfate solution decidedly lowered the pH of the soil.

The water solubility of Thomas slag phosphate [trans. title], H. OSVALD (*Svenska Mosskulturför. Tidskr.*, 46 (1932), No. 2, pp. 141-143).—Samples containing each 100 mg of total phosphoric acid [anhydride?] were treated in each extraction with 500 cc of distilled water. The first extraction dissolved out only a small quantity of phosphoric acid (average about 0.9 mg) but considerable quantities of lime, so that the reaction of the extract was strongly alkaline. After the first three extractions, however, the reaction became practically neutral and remained such through a series of 30 extractions. From one of the samples the first three extractions dissolved out a total of 5.7 mg, the twenty-eighth to the thirtieth, 5.4 mg. From another sample the first three extractions removed 3.1, the last three 5.5 mg of phosphoric acid. The total removed in the 30 extractions was from the first sample 68.2 mg, from the second sample 60.5 mg. The reactions after 30 extractions were, respectively, pH 6.6 and pH 6.5. The citric acid solubility was 93 percent of the total in the first and 89 percent in the second sample, the 30 water extractions thus removing 73.3 and 68 percent, respectively, of the citric acid soluble phosphate.

It is concluded that Thomas slag phosphate will be well utilized in acid soils, with an after-effect longer than that of superphosphate, whereas in slightly alkaline soils of relatively high lime content the Thomas phosphate will be of slight effect by reason of its low solubility at alkaline reactions in the presence of lime.

Assimilation of phosphorus and potassium by barley plants grown according to Neubauer procedure and in undiluted soil, J. W. AMES and K. KITSUTA (*Soil Sci.*, 35 (1933), No. 3, pp. 197-207).—In the Neubauer experiments (*E.S.R.*, 53, p. 319) here reported in a contribution from the Ohio Experiment Station, the seedlings grown respectively in small quantities and in larger samples of the undiluted soil gave different indications as to the phosphorus and potassium requirements of the soil. When 100 barley plants were grown, on the one hand, 18 days in 100 g of the soil diluted with 300 g of pure quartz sand, and on the other hand, in 9 lb. of the undiluted soil, there was found an inverse relation between the percentage content of phosphorus and potassium in plants and the amount of soil. The plants grown in 100 g of soil contained more phosphorus, whereas the potassium content was considerably greater in plants grown in the larger amount of soil. Application of the plant analysis method for determining the available phosphorus supply in soils of fertility experiment plats did not furnish significant indications of increased amounts of phosphorus residual from superphosphate, bone meal, and basic slag. Available phosphorus supplied by superphosphate when the barley was planted was more consistently indicated by the phosphorus content of plants and its removal from the larger amount of soil.

Both the Neubauer seedling procedure and the method of growing plants for the same length of time in undiluted soil as generally followed in vegetative tests showed there was a reserve supply of potassium in soil fertilized with muriate of potash. The plant analysis method proved to be satisfactory for furnishing information regarding the available potassium reserves from previous fertilizer treatment, but failed to indicate differences in the phosphorus supply of unfertilized and phosphated soils.

Barley grown in 100 g of soil in accordance with the Neubauer procedure appeared to have the capacity to assimilate a considerable quantity of potassium from sources other than the exchangeable potassium content of the soil.

Differential response of certain soil types to applications of calcium arsenate, W. R. PADEN (*Jour. Amer. Soc. Agron.*, 24 (1932), No. 5, pp. 363-366, figs. 4).—The tests here reported were made on Davidson clay loam and Durham coarse sandy loam. These soils are stated to "differ widely in their physical and chemical properties," and to have been subjected to the use only of very small quantities of calcium arsenate, cotton and cowpeas being used as test plants. On the basis of the trials described, "it is possible to arrange some of the more important soils of the Piedmont section into groups according to their expected response to the additions of arsenic. Dark-colored soils may be expected to be more tolerant than light-colored soils; likewise fine-textured soils may be more tolerant than coarse-textured soils. The data indicate that calcium hydroxide may reduce appreciably the arsenic injury on Durham soil."

Kinds and amounts of different fertilizers North Carolina farmers used during the fiscal year, 1931-32, C. B. WILLIAMS (*North Carolina Sta. Agron. Inform. Circ.* 79 (1933), pp. [1]+5).—The circular is essentially a tabulated tonnage report of complete fertilizers, of two-component fertilizers, and of raw materials.

Registration, labeling, inspection, and sale of commercial fertilizer, 1932, F. B. MUMFORD and L. D. HAIGH (*Missouri Sta. Bul.* 321 (1933), pp. 30).—This bulletin records the usual information on the 1932 fall collection of fertilizer samples (E.S.R., 68, p. 309).

AGRICULTURAL BOTANY

The dispersal of plants throughout the world, H. N. RIDLEY (*Ashford, Eng.: L. Reeve & Co., 1930, pp. XX+744, pls. 22*).—"This book is an attempt to collate and compare the observations and records on the subject. . . . The complete story of dispersal, however, is not yet finished, and there is still a large field of work for observers. . . . Throughout this work I have used the old-fashioned scientific names of plants and animals as popularly employed before the system of modern alterations in nomenclature came into use, as it is easier to understand what plant or animal is referred to by these names. . . . A large number of really unnecessary new words have been invented in ecological works for all kinds of conditions, states, and phenomena of dispersal and distribution. These I have excluded altogether, except where they actually convey a fact or theory which cannot be stated otherwise than by a long sentence."

Plant physiology (5. *Internatl. Bot. Cong., Cambridge, 1930, Rpt. Proc.*, pp. 420-460).—Papers on carbon metabolism of the higher plants included Physiology of the Organic Acids in Green Plants [trans. title], by W. Ruhland; Induction Periods in Photosynthesis Experiments, by G. E. Briggs; The Connection between the Oxybiotic and Anoxybiotic Respiration in Plants, by P. B. Jensen; Growth Curves of *Pythium* and *Raphanus*, by A. E. Navez; Respiration and Oxygen Concentration, by F. F. Blackman; The Activation of Amylase by Cyanide in vitro and in vivo, by C. S. Hanes and J. Barker; and Inter-relationships of Organic Acids and Carbohydrates in Succulent Plants, by T. A. Bennett-Clark; Papers on the permeability and osmotics of the plant cell included Permeability of Protoplasm [trans. title], by L. Jost; Plasmolysis and Swelling in Plant Cells (Moving Pictures), by S. Prát; The Course of Plasmolysis and Permeability to Water [trans. title], by K. Höfler; The "Multiple Partition Coefficient"

Theory of Penetration, by M. Irwin; Permeability of the Cell Wall for Inorganic Kations and Anions, by V. Úlehla; The Permeability of Plant Membranes to the Halogens, by C. A. Shull; and Permeability to Electrolytes of A Thick Natural Membrane [trans. title], by L. Brauner. Papers on the mineral nutrition and growth of higher plants included Spectroscopic Methods in the Study of Mineral Nutrition, by H. G. Lundegårdh; Phosphoric Acid Concentration and the Growth Rate in Maize, by M. Korczewski; The Mineral Nutrition of Barley, by F. G. Gregory; The Selective Absorption of Potassium by Plants, by E. Demoussy; and The Absorption of Mineral Constituents by Plants from Insoluble Compounds, by K. Bassalik. Papers on methods of investigation of protoplasmic organization included Bio-electric Potentials, by W. J. Osterhout; Electrical Resistance of Single Multinucleate Cells, by L. R. Blinks; The Mechanism of Electrical Response, by H. H. Dixon; The Connection between Growth-producing Substances and Plant Movements, by F. A. F. C. Went; Activities in the Plant Cell As Indicated by X-Ray Methods, by O. L. Sponsler; Treatment of Living Cells with Coloring Materials and Research Reagents [trans. title], by H. Pfeiffer; The Integration of Plant Behaviour, by F. Keeble; and On the Influence of Leaves and Buds on Regeneration Processes in Woody Cuttings, by H. A. A. van der Lek. Papers on the growth and development of higher plants included The Action of A High Tension Electric Discharge on the Growth of Barley, by V. H. Blackman; Nutrient Ions and Enzymic Activity of Plants, by G. Doby; The Range of Structural and Functional Variation of the "Traps" of Utricularia, by F. E. Lloyd; The Transport of Metabolites and Salts in Higher Plants, by T. G. Mason and E. J. Maskell; Some Observations on the Behaviour of Cotton Roots in Deep Soil, by J. Templeton; and The Root As An Indicator of Subsoil Variation, by W. L. Balls. Papers on nitrogen metabolism of higher plants included The Function of Xanthine Derivatives and Alkaloids in the Metabolism of the Higher Plants, by T. Weevers; Movement of Urea in Plants [trans. title], by G. Klein; and Moving Pictures of Plant Movements and Development, by V. Úlehla.

Physiological studies in plant nutrition (*Florida Sta. Rpt. 1932, p. 177*).—Data are reported as to chlorine assimilation in sugarcane and other plants.

A new method of germination and the influence of hydrogen ion concentration on the germination and growth of *Helianthus annuus* and *Lycopersicum esculentum*, R. C. MALHOTRA (*Jour. Indian Bot. Soc.*, 9 (1930), No. 4, pp. 218–239, pls. 2, figs. 3).—A new method of germination is described in which renewal of solutions is possible without molesting or disturbing the seeds, and the influence of H-ion concentration has been studied by this method. It is found that pH 6 appears to be more favorable for the maximum germination of these seeds both in percentage of germination and in the weight gain per unit weight of seeds. The data presented suggest that acidity in the lower ranges is comparatively less harmful in the germination stage than in growth, although this tendency is not very significant. It was also found that pH 6 was favorable for the maximum growth of these plants.

Chemical and physiological studies of after-ripening of seeds of *Rhodotypos kerrioides*, F. FLEMION (*Amer. Jour. Bot.*, 19 (1932), No. 10, p. 837).—When mixed with dampened peat moss better results were secured if seeds were stratified for 1 month at 25° or 30° C. before stratification at 5°. Seeds kept dry for several months at room temperature germinated more strongly than seeds submitted directly to low temperature. A study of excised embryos showed that both embryo and seed coat functioned in dormancy. Analyses during afterripening showed an increase in catalase, peroxidase, and lipase activity, water absorption power, nitrogen soluble in 80 percent alcohol, and

in titratable acid and sucrose. The ether-soluble fraction decreased as after-ripening proceeded.

Dormancy in seeds of *Symphoricarpos racemosus*, F. FLEMION (*Amer. Jour. Bot.*, 19 (1932), No. 10, pp. 836, 837).—Treatment of seeds with concentrated sulfuric acid from 45 to 60 minutes before stratification in moist peat moss held at 5° C. (41° F.) resulted in about 40 percent germination at the end of 7 months. Without acid treatment seeds stratified for 4 months at 25° or 30° before stratification at low temperature gave 75 to 80 percent germination. From the results it is concluded that both toughness of seed coat and embryo dormancy are involved in delayed germination.

The altered rate of growth of freesia corms, W. P. MORGAN and L. J. MICHAEL (*Ind. Acad. Sci. Proc.*, 46 (1930), pp. 103–105).—"Chemical treatment of freesia corms gives only a temporary stimulus to growth. Once growth is established the plant is controlled by other factors in its reaction with its environment."

Experiments on transpiration.—I, The daily water balance of plants in arid regions, R. S. INAMDAR and B. M. DABRAL (*Jour. Indian Bot. Sci.*, 9 (1930), No. 1, pp. 1–30, figs. 5).—In observations recorded as to the water balance of pot plants in the arid climate of Benares, it was noted that there was normally a daily rate of water loss per unit area of evaporating surface in spite of the fluctuations in the evaporating capacity of the atmosphere within certain limits. This maximum value was reached at a relatively low value of evaporating capacity of the atmosphere, about 37 percent of the maximum evaporating capacity obtained under normal conditions. The significance of these observations is indicated. A theoretical discussion of the internal conditions in the plant concerned in the daily water balance is also included, and the observations recorded show that in at least one plant (jasmine) the water content does not vary appreciably in the transpiring leaf. It is concluded that the limit set to the daily maxima of water loss is due to the rate of water supply to the evaporating surface. A discussion is also included of the general use of relative transpiration as a measure of the physiological change in the transpiring capacity of the leaf.

Internal fissures of *Hevea* cortex, H. SUTCLIFFE (*Rubber Res. Inst. Malaya, Quart. Jour.*, 2 (1930), No. 1, pp. 12–15, pls. 8).—An account is given of the formation of internal fissures in *Hevea* cortex. These have been previously found in *Hevea* trees in West Java but not in Malaya. It is suggested that the formation is due to a differential growth rate between hard and soft bast.

Growth inhibition of potatoes by a volatile substance from apples (*Kansas Sta. Bien. Rpt.* 1931–32, p. 88).—The discovery of an inhibitory substance in apple, pear, and hawthorne fruits is noted.

The *Penicillia*, C. THOM (*Baltimore: Williams & Wilkins Co.*, 1930, pp. XIII+644, figs. 99).—"At best, it is possible to present only a very unsatisfactory scheme of classification of this difficult group. In his first scheme of study [(E.S.R., 22, p. 531) the author] attempted to follow the lines set by bacteriology in proposing to separate species upon the presence, absence, or intensity of selected biochemical reactions." This scheme, while useful in helping to fix upon fairly broad groups, was not completely satisfactory for separation within related series. The further development of plan and method for the grouping of members of the *Aspergillus* group is indicated. "Some 600 names have been found applied to *Penicillia* and related organisms. . . . To lay a foundation for a permanent knowledge of this lot of molds, the whole range of morphology and physiology must be searched for marks of separation stable enough and sharply enough marked to convey to the reader a definite picture of the organisms studied. Then organism by organism they must be fitted into the scheme of classification to form a consistent and interpretable whole."

GENETICS

The mechanism of creative evolution, C. C. HURST (*New York: Macmillan Co.; Cambridge, Eng.; Univ. Press, 1932, pp. XXI+365, pl. 1, figs. 199*).—Genetic theories are outlined and described, followed by a discussion of creative evolution, in which organisms show a gradual growth in complexity resulting from an increased complexity of the gene make-up brought about by additional mutations and transmutations of genes and chromosomes.

The part played by recurrent mutation in evolution, J. B. S. HALDANE (*Amer. Nat.*, 67 (1933), No. 708, pp. 5–19).—The evolutionary effects of mutation are discussed with reference to evolution due to a mutation rate so large as to cause the spread of a disadvantageous character, primary effects of the spread of genes nearly neutral from the point of view of natural selection, and secondary effects of frequent disadvantageous mutations. It is concluded that mutations provide the material for selection to act upon, and may give rise to primary and secondary effects by accumulation of mutant genes and by protection against lethal genes. These may account for the disappearance of useless organs and the fact that the heterogametic sex is usually male.

Chromosomes in Gossypium and related genera, A. E. LONGLEY (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 3, pp. 217–227, figs. 5).—Cytological studies by the author and by other investigators (*E.S.R.*, 52, p. 823; 61, p. 629) show *Gossypium* species to be characterized by the haploid numbers 13 in the Asiatic group and 26 in the American group. Two wild species *G. davidsoni* and *G. harknessi*, indigenous to North America, *G. sturti* of Australia, and *Thurberia thespesiodes* and *Shantzia garckeana*, closely allied to *Gossypium*, also belong to the Asiatic group. The distribution of the 13-chromosome forms suggests that the ancestors of our American forms of cultivated cottons belonged to the low-chromosome group. The chromosome behavior during meioses of pollen mother cells of species and most hybrids between forms with the same chromosome number is regular. Marked irregularities are prevalent in a few plants derived from crossing species with the same chromosome number and are universal in an F_1 hybrid between forms with different chromosome numbers.

Inheritance studies in barley [trans. title], A. P. LUNDEN (*Meld. Norges Landbr. Høiskole*, 11 (1931), No. 3, pp. 143–168; *Eng. abs.*, pp. 165–167).—The inheritance of rachilla hairs, awn, internode length, and straw length was studied in Asplund \times D.S. 295 and Holleby \times Smooth Awn. All were 6-rowed barleys, Asplund having short rachilla hairs, rough awns, short internodes, and D.S. 295 having long hairs, smooth awns, and long internodes. Holleby differed from Smooth Awn in the first characters, having short headed rachilla and rough awns.

Long rachilla hairs were dominant to short and rough awns dominant to smooth, both pairs being inherited on a single factor basis. The factor for awning was identical with the *Rr* factor of other investigators. The *Ss* factor for awning could not be recognized in these crosses. The inheritance of internode length in Asplund \times D.S. 295 depended on two factors, *Aa* and *A \hat{a}* , which segregated independently. F_1 , F_2 , and F_3 were intermediate in internode length. In F_2 , constant plants of the parent types, as well as of two intermediate types, were recovered. These intermediates differed in internode length in the lowest part of the spike. No correlation was observed between internode length and straw length in Asplund and D.S. 295, or in their hybrids. Although *Aa* and *A \hat{a}* , factors for internode length, did not appear to be linked with *Ll* for long v. short rachilla hairs or *Rr* for rough v. smooth awn, *Ll* and *Rr* were linked with a crossover percentage of 29.4.

Inheritance of resistance to bunt, *Tilletia tritici* (Bjerk.) Winter, and other characters in certain crosses of "Florence" wheat, J. G. CHURCHWARD (*Linn. Soc. N.S. Wales, Proc.*, 57 (1932), pt. 3-4, pp. 133-147, figs. 4).—Studies into F_3 indicated a single factor difference with dominance of susceptibility to bunt in crosses between Florence, a resistant wheat, and each of the susceptible varieties Firbank, Gullen, Yandilla King, and Marshall No. 3. The ratios of 13 normal : 3 dwarfs in 3 of the crosses indicated the action of an inhibiting factor, while in Florence \times Yandilla King the F_2 ratio approximated 55:9, and F_3 results confirmed the assumption of a dominant inhibiting factor and 2 dominant factors for dwarfness. In Gullen \times Florence, and Hard Federation \times Florence, a single factor determined the inheritance of chaff color, which was independent of bunt resistance.

Inheritance in *Nicotiana tabacum*.—VIII, Cytological features of *purpurea* haploid, R. H. CHIPMAN and T. H. GOODSPEED (*Calif. Univ. Pubs. Bot.*, 11 (1927), No. 8, pp. 141-158, figs. 3).—The eighth number of this series (E.S.R., 56, p. 631) gives a detailed description of the cytological behavior of a *N. tabacum purpurea* haploid (E.S.R., 51, p. 827).

Inheritance in *Nicotiana tabacum*.—IX, Mutations following treatment with X-rays and radium, T. H. GOODSPEED (*Calif. Univ. Pubs. Bot.*, 11 (1930), No. 16, pp. 285-298, figs. 4).—Three recessive monogenic mutations induced by treatment of *N. tabacum purpurea* with X-rays and radium, described as to genetic and cytological characteristics, involve pink flower color, pistillody of the androecium, and albino seedlings.

Inheritance in *Nicotiana tabacum*.—X, Carmine-coral variegation, R. E. CLAUSEN (*Cytologia*, 1 (1930), No. 4, pp. 358-368, figs. 9).—The recessive type coral, a derivative of fluted, is shown to have arisen by a modification of the F chromosome (F-co). The origin of a carmine-coral variegated type from fluted \times coral is described. It is shown to depend upon the presence of a fragment of the F chromosome (f-co) containing the factor or factor complex for carmine as opposed to the coral.

Inheritance in *Nicotiana tabacum*.—XI, The fluted assemblage, R. E. CLAUSEN (*Amer. Nat.*, 65 (1931), No. 699, pp. 316-331).—When selfed, fluted (E.S.R., 56, p. 631) produced as further variants the distinctive recessive types coral and mammoth, both established in pure lines and due to secondary modification of the F chromosome. Coral and mammoth crossed with normal or with each other produced hybrids of the normal type which, however, exhibit frequent nonconjunction of the F chromosomes. By reason of this nonconjunction, F_2 and other derivative populations from these crosses contain some haplo-F and triplo-F individuals besides the expected classes of offspring. Hybrids of coral with mammoth apparently exhibit no crossing over between the two modified F chromosomes. Other forms observed in the course of the investigation were pale sterile, carmine-coral variegation, and reversionary self-carmine. It appeared that coral must represent some modification of the F chromosome more extensive than simple factor mutation. The F chromosome in the univalent condition seemed subject to some forms of genetic modification which occur rarely, if at all, in normal material.

Studies in Indian pulses: A note on the cytology of "Kabuli" and "Desi" gram types, P. D. DIXIT (*Indian Jour. Agr. Sci.*, 2 (1932), No. 4, pp. 385-390, pls. 3).—The white large-seeded gram (*Cicer kabulium*) was observed to have 16 as its diploid chromosome number instead of the 14 observed in ordinary cultivated forms of *C. arietinum*. A mutational origin of Kabuli gram from white small-seeded varieties was indicated.

Studies in Indian pulses: A case of gigantism in gram (*Cicer arietinum*), P. D. DIXIT (*Indian Jour. Agr. Sci.*, 2 (1932), No. 4, pp. 391-408, pls. 5).—A giant mutant appearing in gram type 22 at Pusa was characterized by enormous increase in size of plants and all organs compared with the parent, and its diploid chromosome number was 16 v. 14 in the parent.

Genetics of the soybean, C. M. WOODWORTH (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 1, pp. 36-51, figs. 7).—Progress to date in the genetic analysis of the soybean is shown by a list of genes in soybeans, and a chromosome map. Another and more detailed discussion of soybean genetics (E.S.R., 68, p. 463) also described attempts to analyze seed yield into simpler components and genetic correlations among the several components and yields.

The inheritance of several new characters is described from recent studies at the Illinois Experiment Station. Bloom on the seed coat appeared due to three complementary genes, B_1 , B_2 , and B_3 , all of which must be present for its expression. Variegated leaf (v_1) was found to be a simple recessive to normal (V_1) and determinate pod-bearing habit (dt) a simple recessive to indeterminate habit (Dt). Softness of seed coat, i.e., ability to imbibe water readily, appeared to be partly dominant in the F_1 to hardness, and wide variation occurred in F_2 , a few segregates even transcending parental limits. A relation of seed color was indicated with the color genes, R_2T appearing to be involved. In three crosses showing hybrid vigor, one variety was a common parent in two.

Hybridization in *Trifolium pratense* [trans. title], F. E. NIJDAM (*Genetica [s Gravenhage]*, 14 (1932), No. 3-4, pp. 161-278, figs. 29).—Systematic crossing was carried on with 3 F_2 generations of a pair of unrelated P_1 red clover plants, 8 sister plants of each generation being crossed in all possible combinations. Two of the F_2 groups consisted of 2 intra-incompatible but inter-compatible groups, and the third F_2 comprised 4 groups. Systematic crosses between 15 sister plants of an F_3 generation from unrelated ancestors showed again 2 intra-incompatible and inter-compatible groups.

Plants were produced with pure yellow and with pure violet seeds. Crosses between similar plants gave a constant offspring. An F_1 generation uniform in seed color could not be obtained by crossing yellow and violet. The F_2 generation of these crosses segregated into all transitions from yellow to violet in seed color. Back-crossing an F_1 plant with one having pure violet seeds produced only plants with very dark violet seeds, while back-crossing with a plant having pure yellow seeds produced a segregating offspring largely with light colored seed. The number of plants with pure yellow seeds in these groups led in one case to the suggestion of 5 factors for violet tingeing in F_1 . A certain amplitude of variation in color seemed to exist in plants having seeds of more than one color, the distribution being controlled practically by the genetic constitution. The effect of a single factor V , for violet, and possibly of X , for intensifying color, was evident in certain groups selected for yellow seed. Variation in the shade of yellow seemed to be controlled by C . The shade of violet changed from red to violet and purple blue due to R .

Plants with white flowers seemed to lack the factor G for anthocyanin production. In the flowers, series of purple and flesh-pink tints could be distinguished. Purple was dominant, but plants heterozygous for the purple factor B might often be distinguished easily from the homozygotes. Purple modifying factors did not affect pink color. In a few segregations 3 factors seemed to affect the intensity of purple. Normal green leaf color became yellowish green in the absence of N . Examples of albinism were also noted.

Sterile stamens were found due to a factor P . A factor D appeared necessary for normal development, whereas dd plants showed a typical dwarf habit

and were only a few centimeters in height. This dwarf variety also had many morphological and anatomical differences from normal. Constant specimens of a type with little growth, short branches, often abnormal leaves, and poor flowering were recessive to normal. The F_2 showed irregular monohybrid segregation.

The bibliography lists 72 titles.

Studies in animal reproduction and inheritance (Kansas Sta. Bien. Rpt. 1931-32, pp. 82-84).—Modifiers for red color, long hair, a nervous character called "trembling", and sex in guinea pigs are reported. Findings are also given on the inheritance of eye defects, bad temper, and wry neck in rabbits and the inheritance of color in cattle, all by H. L. Ibsen, and the location of a lethal factor in *Apotettix eurycephalus* and the influence of X-rays and violet and white light on chromosome behavior and the reproductive cycle in the grouse locust, by R. K. Nabours.

Dominant vs. non-dominant genes in the multiple factor hypothesis of size inheritance, H. D. GOODALE (*Jour. Heredity*, 23 (1932), No. 12, pp. 487-498, fig. 1).—The author discusses the consequences of the multiple factor hypothesis, and points out the conditions that must be complied with in cases of nondominant genes and the failure in a number of cases cited from the literature of the F_1 s to be halfway between the parent races in size. Genotypic and phenotypic ratios expected under different conditions are tabulated. From various tests it is suggested that the current explanation of size inheritance by means of nondominant genes is not adequate to explain the observations, but that many may be explained by the existence of dominant genes in various degrees of heterozygosity.

Genetical evidence for a cytological abnormality in man, J. B. S. HALDANE (*Jour. Genetics*, 26 (1932), No. 3, pp. 341-344).—Six human pedigrees showing abnormal inheritance have been selected from the literature, which the author explains on the basis of nondisjunction of the sex chromosomes, suggesting that the women were XXY .

Milk goat improvement (*New Mexico Sta. Rpt.* 1932, p. 55).—An account is given of inbreeding and the inheritance of a character described as double teat.

A report on the progeny of a tortoise-shell male cat, together with a discussion of his gametic constitution, R. C. BAMBER (BISBEE) and E. C. HERDMAN (*Jour. Genetics*, 26 (1932), No. 1, pp. 115-128).—In breeding studies a male tortoise-shell cat was found to give the progeny expected of a yellow male with one exception. In matings with black females there were produced 13 black males, 14 tortoise-shell females, and 1 black female. When mated with yellow females the offspring were 9 yellow males, 8 yellow females, and 1 anomalous yellow male. In matings with tortoise-shell females there were produced 1 black male, 1 yellow male, 5 yellow females, 2 tortoise-shell females, and 1 anomalous yellow female. The expected results were approximately obtained in matings of the tortoise-shell and yellow daughters with black and yellow males.

Various theories advanced to explain the occurrence of tortoise-shell males are discussed, and it is concluded that nondisjunction of the yellow part of the black-bearing sex chromosome in the mother of the male best explains the results.

On the morphogenetic relation of body weight in the newborn to organ and bone weight in the mature mouse [trans. title], S. KOPEĆ and M. LATYSZEWSKI (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 63 (1932), No. 3, pp. 185-194).—Determinations were made at 253 days of age in the 81 male

and 78 female mice referred to in the preceding abstract. Comparison of the size of the organs and bones in the mice born in litters of from 5 to 9 and those born in litters of from 10 to 13 revealed practically no significance in the differences observed. In contrast, significant differences were observed in the bones and the weights of certain organs from the mice grouped as to those which were above and below the average weight for the individuals in the litters at birth.

Investigation of the morphogenetic relation of birth weight to body weight in the mouse [trans. title], S. KOPEĆ (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 63 (1932), No. 1-2, pp. 94-111, figs. 4).—Comparison is made of the mature weights and birth weights of 81 male and 78 female mice born in two litter sizes, i.e., 5-9 and 10-13. These results indicate that the differences in birth weights are reliable indicators of mature weight differences.

Hydrocephalus, a hereditary character in the house mouse, F. H. CLARK (*Natl. Acad. Sci. Proc.*, 18 (1932), No. 11, pp. 654-656, fig. 1).—An account is given of the occurrence of hydrocephalic offspring in the F_2 and back-cross generations of mice involving the flexed-tail character. Hydrocephalus was evidently inherited as a single Mendelian factor, the recessive being lethal. Its frequent association with flexed tail suggests the possibility of linkage, or that the two characters are manifestations of the same gene.

A hairless mutation in the rat, W. WILDER, R. M. BETHKE, C. H. KICK, and W. P. SPENCER (*Jour. Heredity*, 23 (1932), No. 12, pp. 480-484, figs. 3).—An account is given of the occurrence of a hairless mutation in the rat colony of the Ohio Experiment Station. In breeding tests it appeared to be recessive to the normal. Matings of heterozygotes produced 140 normal and 45 hairless offspring, and in back-cross matings there were produced 21 normals and 17 hairless young. Hairless females were usually sterile. Hairless males tended to regenerate more hair than females during the wave of hair regeneration about the third or fourth month. The hairless character was not linked to albinism.

Cytogenetic studies on the rat. Somatic chromosome complex, meiosis, and chiasma frequency, W. BRYDEN (*Jour. Genetics*, 26 (1932), No. 3, pp. 395-415, figs. 17).—The behavior of the 42 chromosomes in the cell division in male and female rats from 3 weeks to 9 months of age is described from the University of Edinburgh. Special attention is given to chiasma frequency and its relation to crossing over. The number of chiasmata per bivalent observed in the male was found to decrease with advancing stages of mitosis from 1.91 in the early diplotene to 1.56 in the metaphase. The mean number of chiasmata in females is 1.98, and in males 1.56. The greater frequency of chiasmata in females corresponds with the findings of larger amounts of crossing over in females. The observations suggest that crossing over takes place in the early prophase stages and that the chiasmata are the result of crossing over.

Differences in bactericidal power of the blood within an inbred strain of rats, M. R. IRWIN and T. P. HUGHES (*Soc. Expt. Biol. and Med. Proc.*, 29 (1931), No. 3, pp. 295-297).—The ability of the blood of inbred rats to destroy *Streptococcus enteritidis* organisms was tested by the incubation of cultures with samples of blood and determination of the number of living organisms at the end of four hours. Individual rats showed marked differences in the bactericidal power of the blood. Matings of animals in which the blood showed low bactericidal power produced 11 young also classed as low, whereas matings of individuals classed as high with others classed as low produced 18 offspring in which the power of the blood to destroy *S. enteritidis* organisms was classed as low in 12 and high in 6.

Blood group inheritance in the rabbit, W. E. CASTLE and C. E. KEELER (*Natl. Acad. Sci. Proc.*, 19 (1933), No. 1, pp. 92-98).—The occurrence of two agglutinogens in the blood of rabbits is noted, together with inheritance studies of them. The genes for both were dominant to their absence. In matings involving these characteristics, it was found that they were either due to different allelomorphs of the same gene or closely linked. The occurrence of four h_1h_2 and two H_1H_2 individuals in 308 offspring from a mating of h_1h_2 and H_1H_2 parents and two h_1h_2 young among 154 from a mating of h_1H_2 and H_1H_2 parents are attributed to imperfect technic.

Tests for linkage between the blood-group genes and other known genes of the rabbit, W. E. CASTLE and C. E. KEELER (*Natl. Acad. Sci. Proc.*, 19 (1933), No. 1, pp. 98-100).—The results of tests of the linkage relations between the genes for the hemagglutinogens described in the above paper, and the genes for agouti, intense pigmentation, extended black pigmentation, English spotting, and rex coat are reported, with negative results as far as linkage is concerned. The deviations from independent inheritance were in all cases less than twice their probable errors.

[Breeding experiments with poultry at the Kansas Station], D. C. WARREN (*Kansas Sta. Bien. Rpt.* 1931-32, pp. 72-74, 81, 82).—Findings are reported as to the inheritance of crookedness of the keel bone, distinguishing the sex at hatching of Single Comb Rhode Island Red chicks on the basis of rate of feather development, linkage relationships between breed characteristics, inheritance of egg production in Single Comb Rhode Island Red chickens, and influence of hybridization upon vigor in poultry.

Inheritance of spangling in the domestic fowl, L. W. TAYLOR (*Jour. Genetics*, 26 (1932), No. 3, pp. 385-394, pls. 3).—From studies at the University of California of crosses between Silver Spangled Hamburg, Rhode Island Red, and Black Minorca fowls, it is concluded that spangling is due to a dominant autosomal gene which is incompletely dominant in the absence of extension factors for black. The expression of spangling is complicated by limitations in the expression of black and the sex-linked gold factors. The action of the female sex hormone is used to explain the greater development of black pigment in females than in males.

The suggested composition of the three breeds for spangling and extended black is Rhode Island Reds, $ReRe E^m E^m spsp$; Black Minorca, $rere E^m E^m spsp$; and Silver Spangled Hamburg, $rere e^m e^m SpSp$; in which Re is the dominant gene for nonextension of black, E^m is dominant for extension of black, and Sp is dominant for spangling.

The chromosomes of the domestic chicken, M. J. D. WHITE (*Jour. Genetics*, 26 (1932), No. 3, pp. 345-350, pls. 4).—Studies of the chromosomes in somatic tissue of fowl embryos, conducted at the University College, London, showed that the diploid number is approximately 66 in males and 65 in females. There is great variation in the size of the chromosomes, but the sex chromosomes are the largest. The W chromosome was not found in females.

Studies on the creeper fowl.—II, Morphology and histology of the skeleton, especially the long bones [trans. title], W. LANDAUER (*Ztschr. Mikros. Anat. Forsch.*, 25 (1931), pp. 115-180, figs. 36; *Eng. abs.*, pp. 175-178).—Continuing this series (*E.S.R.*, 65, p. 425), the morphology and histology of the skeleton of embryonic, growing, and adult creeper fowls are described as compared with the conditions found in chondrodystrophy in humans.

Studies on the creeper fowl.—IV, The abnormal development of homozygous creeper embryos in the later stages of development (phoko-

melia and chondrodystrophy) [trans. title], W. LANDAUER (*Ztschr. Mikros. Anat. Forsch.*, 32 (1933), No. 3, pp. 359-412, figs. 27; *Eng. abs.*, pp. 408-411).—In this continuation of the series (E.S.R., 68, p. 606) detailed descriptions are given of homozygous creeper embryos which survived the normal lethal date, from the third to the fourth day of incubation, but died between the tenth and twenty-second day of incubation.

Descriptions are included of the anatomical and histological studies, particularly of the skeletal parts and the eye. The weights of the creeper fowls were materially reduced as compared with normals, and the shortening of the long bones and the malformation of the skull were pronounced.

It is suggested that the creeper gene is probably a sectional deficiency of the chromosome.

Studies on the creeper fowl.—V, The linkage of the genes for creeper and single-comb, W. LANDAUER (*Jour. Genetics*, 26 (1932), No. 2, pp. 285-290).—Continuing this series of studies (see above), F₁ rose-comb creeper fowls were produced by mating the four lines of creeper fowls from Scotland, Germany, America, and the Marquesas Islands with normal rose-comb birds. These diheterozygous F₁s were back-crossed in reciprocal matings with Single Comb White Leghorns, and a very close linkage between the creeper and single-comb genes was found. Among the 6,627 back-cross individuals obtained there were only 25 crossovers. The crossover percentage in females was 0.57 percent, and in males 0.13 percent. All four creeper lines appeared to be due to an identical mutation.

Chondrodystrophy in fowl embryos, S. S. MUNRO (*Sci. Agr.*, 13 (1932), No. 2, pp. 97-109, figs. 6).—Chondrodystrophy was found to cause about 8 percent of the embryonic deaths occurring after the seventh day during the early part of the hatching season. The frequency of occurrence of this condition declined as the season advanced. Sunlight is suggested as an important etiological factor, but something other than vitamin D appears to be responsible. Although this condition seems to have some hereditary basis it is not a simple recessive.

In the rhesus monkey ovulation is spontaneous, G. W. CORNER (*Soc. Expt. Biol. and Med. Proc.*, 29 (1932), No. 5, pp. 598, 599).—Four female monkeys kept in separate cages showed recent corpora lutea in their ovaries, indicating the occurrence of spontaneous ovulation in this species without copulation.

Maturity in the female mouse, L. MIRSKAIA and F. A. E. CREW (*Roy. Soc. Edinb. Proc.*, 50 (1929-30), No. 2, pp. 179-186, fig. 1).—The attainment of sexual maturity was studied in 58 colored and 42 albino female mice. It was found that there were considerable individual differences between the stocks in this respect as well as in other breeding and reproduction characteristics, making it necessary for each worker to standardize his own stock and his own environment.

On the presence of a kyogenic substance in the mouse placenta, L. MIRSKAIA (*Roy. Soc. Edinb. Proc.*, 50 (1929-30), No. 1, pp. 104-112, pl. 1).—It was demonstrated by implantations of mouse placenta into immature female mice that the placenta contained an active kyogenic substance, since the following conditions were produced: Characteristics of pregnancy in the vaginal epithelium, growth of the follicles in the ovary, and enlargement of the interstitial tissue.

The effect on lactating mice of injecting an extract of the urine of pregnancy, E. V. ENZMANN and G. PINCUS (*Amer. Jour. Physiol.*, 103 (1933), No. 1, pp. 30-33, figs. 8).—Extracts of pregnancy urine had a deleterious effect on lactating mice, as measured by the rate of growth and mortality of the young.

Effects produced by intravenous and intraperitoneal injections of urine of pregnancy in immature female rabbits, J. M. WOLFE and E. T. ELLISON (*Soc. Expt. Biol. and Med. Proc.*, 29 (1932), No. 5, pp. 600, 601).—A comparison of the effects produced by intraperitoneal and intravenous administration of pregnancy urine to immature female rabbits showed very different results. Intravenous injections stimulated follicles having well-developed cavities, but did not act on the smaller and more primitive follicles. On autopsy the ovaries of animals which had received intraperitoneal injections contained a large number of small blood follicles with marked luteinization of most of them.

Specificity in action of anterior pituitary of different mammals and urine of pregnant women on ovary and thyroid, L. LOEB (*Soc. Expt. Biol. and Med. Proc.*, 29 (1932), No. 5, pp. 642-644).—A summary is given of the effects of the administration of the anterior pituitary from cattle, male guinea pigs, rabbits, and cats, and the urine of pregnant women on the ovaries and thyroid glands of immature guinea pigs. Differences in the action of the pituitary substances from different sources are noted. The tendency to cause hypertrophy in the thyroid glands was related to the ability of these substances to produce interstitial glands and pseudolutein tissue in the ovary, but seemed independent of their ability to accelerate follicle maturation and to produce ovulation. The urine of pregnant women caused a marked production of interstitial gland and pseudolutein tissue without causing thyroid gland hypertrophy, suggesting that the active substance in urine differs from the active substance in the anterior lobe of the pituitary.

The gonadotrope actions of the anterior lobe of the pituitary, B. P. WIESNER and F. A. E. CREW (*Roy. Soc. Edinb. Proc.*, 50 (1929-30), No. 1, pp. 79-103, pls. 2).—From studies of the effects of administering the oestrogenic hormone and the implantation of pituitary substance on sexual maturity, it is suggested that there are two gonadotrope factors as well as a growth factor produced by the anterior lobe of the hypophysis.

Volume of the various lobes of the hypophysis during pregnancy in the rat, S. STEIN (*Soc. Expt. Biol. and Med. Proc.*, 29 (1931), No. 3, pp. 282, 283).—Hypophyses removed from pregnant and nonpregnant female rats at approximately 185 g live weight were found to show no significant differences in weight. The relative volume of the lobes was also similar. Other groups from which the hypophyses were compared included animals which had received vitamin E-deficient rations.

The induction of precocious sexual maturity by cortico-adrenal extract, E. L. COREY and S. W. BRITTON (*Amer. Jour. Physiol.*, 99 (1931), No. 1, pp. 33-43, figs. 16).—Injections of cortico-adrenal extract into 63 immature experimental rats caused enlargement of the pituitary gland, premature maturation of the sex glands particularly in the females, and uterine hypertrophy. The development of the pituitary gland was the only change observed in the rats at 20 days of age, but at 28 days the ovaries exhibited corpora lutea and uterine hypertrophy was noted. Histological changes in the testes were first observed at 35 days of age. No significant differences were observed between the thyroid glands of the experimental animals and those of controls injected with adrenalin.

Precocious development of sexual characters in the fowl by homeoplastic hypophyseal implants, I, II, L. V. DOMM (*Soc. Expt. Biol. and Med. Proc.*, 29 (1931), No. 3, pp. 308-312).—Two papers in this series are presented.

I. The male (pp. 308, 309).—The daily subcutaneous implantation over a period of from 19 to 28 days of homeoplastic whole or anterior lobe hypophyseal grafts into Brown Leghorn cockerels from 22 to 86 days of age induced a

marked increase in the development of the comb, precocious sexual behavior, hypertrophy of the testes, and advanced spermatogenesis. No significant modifications were observed in the plumage, spurs, or other organs. Hypophyses obtained from capons were most effective, from cocks next, and from hens least, when employed as the material for the grafts.

II. *The female* (pp. 310-312).—Daily subcutaneous homeoplastic implants of the anterior lobe of the hypophysis were administered for from 19 to 28 days to female Brown Leghorns ranging from 28 to 59 days of age. The grafts stimulated the growth of the head furnishings, especially the comb, and increased the size of the ovaries and other sex glands, and advanced development was shown in histological study of a number of the sex glands. There was no noticeable change in the plumage, spurs, behavior, or histological picture of the ovary. It was believed that the gonad-stimulating hormone of the hypophyseal implants produced a precocious endocrine rather than gametogenetic functioning, which was responsible for the precocious development of other sex characters. The growth of the head furnishings and rudimentary Wolffian ducts in the male resulted from liberation of the male hormone by the stimulated medullary tissue. The female hormone was liberated by the stimulated cortical tissue, and was responsible for the development of the oviduct.

Injection of avian anterior pituitary substance into the Leghorn fowl, J. B. MITCHELL, JR. (*Soc. Expt. Biol. and Med. Proc.*, 29 (1932), No. 5, pp. 645, 646).—In three experiments daily intramuscular injections of anterior lobes of chicken hypophyses were administered to White Leghorn pullets in doses up to 10 lobes for 56 days. There was no response of the female genital system to the pituitary substance.

Purification of corporin, H. L. FEVOLD and F. L. HISAW (*Soc. Expt. Biol. and Med. Proc.*, 29 (1932), No. 5, pp. 620, 621).—The preparation of a crystalline substance with a high corporin potency is described. The uteri of rabbits showing pronounced progestational changes from treatment with the crystalline preparation continued to give a strong response to pituitrin in direct contrast with those which had received crude corporin preparations.

Administration of theelol to the immature Brown Leghorn female, J. B. MITCHELL, JR. (*Soc. Expt. Biol. and Med. Proc.*, 29 (1932), No. 5, p. 644).—The administration of varying doses of theelol to three lots of 5-months-old Brown Leghorn pullets for 96 days caused no inhibition nor stimulation of ovulation.

Does castration in guinea fowls produce sexual differentiation in plumage and changes in head furnishings? J. KRÍŽENECKÝ and L. F. KAMENÍČEK (*Soc. Expt. Biol. and Med. Proc.*, 29 (1932), No. 5, pp. 653, 655).—This is another account of the studies previously noted (E.S.R., 68, p. 318).

FIELD CROPS

Variation of yields obtained in small artificially constructed field plats, R. J. GARBER and W. H. PIERRE (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 2, pp. 98-105).—Study of the variation of the yields of wheat, soybean hay, and Sudan hay, obtained at the West Virginia Experiment Station during three years from 30 concrete soil bins, each 0.001 acre in area, indicated that soil heterogeneity, insofar as it influences yield over a period of years, may largely be removed by mixing the soil thoroughly. However, the uniformity crops of wheat and soybean hay showed that the variance between plats in any one year is still too high to obviate replication. The probable error of a single determination in percentage of the mean for the yield of soybean hay per plat was 3.4, and for the yield of wheat grain plus straw (also for grain alone)

per plat was 6.2, whereas the probable error of a single determination in percentage for the total yield of soybeans and wheat (grain plus straw) per plat was only 2.5 percent.

Examination of the variation of yields of alfalfa obtained from 42 soil bins made with 24-in. sewer tile showed that the height to which soil is filled in the tile may influence markedly the first yields of alfalfa. The correlation coefficient measuring this relation was found to be 0.668. Later yields of alfalfa did not seem to be affected. The probable error of a single determination expressed as a percentage of the mean of total yields of alfalfa grown during one year in triplicated tile plats was found to be 6.74.

[**Experiments with field crops in Florida**] (*Florida Sta. Rpt. 1932*, pp. 28-49, 50, 63, 112-118, 152-156, 180-184, 205-207, 208-212, 217, 218, figs. 6).—Agronomic investigations (E.S.R., 67, p. 516), by W. E. Stokes, J. P. Camp, J. D. Warner, F. H. Hull, G. E. Ritchey, W. A. Leukel, A. Daane, R. W. Kidder, R. W. Ruprecht, M. R. Ensign, W. A. Carver, L. O. Gratz, R. R. Kincaid, R. M. Crown, B. A. Bourne, and F. D. Stevens, again reported on from the station and substations, comprised breeding work with corn, sweet corn, cotton, peanuts, and sugarcane; induction of mutations by heating seed corn; variety trials with corn, sweet corn, cotton, sorgo, grain sorghum, sugarcane, millet, peanuts, *Crotalaria* for hay, miscellaneous forage, pasture, and lawn grasses, legumes, and winter cover crops; variety-date-of-planting tests with cowpeas and soybeans; fertilizer tests with corn, oats, cotton, peanuts, sugarcane, potatoes, Austrian winter peas, vetch, and tobacco; date-of-planting and turning under winter legumes for corn and their phosphorus needs; soil amendment studies with peanuts; cultural (including planting) trials with corn, cotton, potatoes, and peanuts; a photoperiodism experiment, a comparison of mechanical pruning v. freezing, and a paper mulch test with potatoes; germination studies with tobacco seed; and crop rotations using winter legumes. Pasture investigations were concerned with competition, carrying capacity, effects of fertilizers and frequency of cutting on yield and composition of grasses; fertilizer, lysimeter, and growth behavior studies with pasture grasses; the growth behavior of and influence of different fertilizer formulas on yields of Bahia grass; and pasture studies on peat and muck soils. Several phases of the work were in cooperation with the U.S. Department of Agriculture.

[**Field crops work in Georgia, 1932**] (*Georgia Sta. Rpt. 1932*, pp. 12-25, 37, 49, figs. 3).—Agronomic activities (E.S.R., 66, p. 729) again reviewed briefly comprised breeding work with oats, wheat, and soybeans; studies of wheat-rye hybrids (E.S.R., 67, p. 513); variety trials of soybeans for seed and hay; variety-time-of-planting tests with cotton; development of one-variety cotton centers; effects of time and method of planting on germination of cotton-seed, and of low temperature and early planting on the germination of seed of cotton varieties; fertilizer studies with cotton dealing with placement, addition of dolomitic limestone where acid-forming nitrogen carriers are used, supplements for concentrated fertilizer, nitrogen carriers, and comparisons of ammoniated superphosphate and other phosphorus carriers, with and without gypsum and limestone supplements; comparison of ammonium and nitrate nitrogen for cotton plants in water cultures; fertilizer tests with cowpeas, vetch, and Austrian winter peas; and fertilizer trials with sweetpotatoes and corn and spacing tests with sweetpotatoes at the Mountain Substation. Certain phases of the work were in cooperation with the U.S. Department of Agriculture.

[**Field crops research in Kansas, 1930-32**] (*Kansas Sta. Bien. Rpt. 1931-32*, pp. 30-32, 33-45, 47-50, 117-119, 121-123, 124, 125, 126).—Agronomic experiments (E.S.R., 64, pp. 826, 835) reported on again from the station and

substations included variety tests with winter and spring wheat, corn, pop corn, oats, barley, grain sorghum, sorgo, flax, potatoes, soybeans, red clover, alfalfa for yield, winter hardiness, and wilt resistance, sweetclover, bentgrass for lawns, and miscellaneous grasses and legumes; breeding work with corn, pop corn, wheat, oats, barley, grain sorghum, soybeans, alfalfa, and sweetclover; cultural (including planting) experiments with corn, wheat, barley, grain sorghum, sorgo, soybeans, alfalfa, and buffalo grass; comparison of seed bed preparations for wheat, flax, Sudan grass, and sweetclover; harvesting tests with soybeans; effect of moisture content on keeping quality of grain sorghum; cold resistance studies with wheat and alfalfa varieties; seed treatments for corn; fertilizer trials with wheat and alfalfa; liming tests with sweetclover; studies of wheat quality as influenced by seed bed preparation, variety, and heritable factors; chemical and tempering factors affecting the quality of flour; a study of gluten proteins, crude fiber, and other factors thought to influence gluten quality; fertilized, irrigated, and ordinary crop rotations; irrigation requirements of alfalfa, sugar beets, grain sorghum, and sorgo; pasture improvement work including management of livestock and effect of burning on bluestem pastures, eradication of undesirable plants, effects of various clippings (simulating grazing), and of fertilizers on yield, vigor, and quality of pastures, and determination of nutritive content and organic food reserves of pasture plants; clipping, watering, and fertilizer tests and weed control on lawns; and control of bindweed, Johnson grass, and narrowleaf plantain by chlorate sprays. Certain lines of work were in cooperation with the U.S. Department of Agriculture.

[Field crops experiments in New Mexico] (*New Mexico Sta. Rpt. 1932*, pp. 15-22, 23, 24, 25-27, 33-37, 52-54, 66-68, 70, 71).—Agronomic investigations (E.S.R., 67, p. 29), reported on from the station and from outlying fields near Clayton, Capulin, and Mosquero, embraced variety tests with winter- and spring-sown wheat, oats, barley, corn, grain, sorghum, sorgo, cotton, alfalfa, soybeans, cowpeas, field beans, millet, and miscellaneous hay crops; breeding work and biometrical (E.S.R., 67, p. 519) and genetic studies with cotton; response of winter wheat to different dates of planting and methods of soil preparation; fertilizer trials with cotton (E.S.R., 67, p. 380) and alfalfa; irrigation and spraying tests with potato varieties; studies of the annual production of sugar beet seed, involving method, rate, and date of planting, and rate of irrigation; breeding for resistance to the curly top disease of sugar beets; investigation of factors affecting growth and germination of chamiza (*Atriplex canescens*), winter fat (*Eurotia lanata*), and *Valota saccharata*; trials of range-plants; adaptation of various grasses and Ladak alfalfa for range improvement; germination tests of seed of range forage plants; determination of the protein and moisture content of samples of New Mexico wheat grown on dry land and under irrigation; and control of Johnson grass by chlorate spray. Several lines of work were in cooperation with the U.S. Department of Agriculture.

[Crops experiments in Rhode Island] (*Rhode Island Sta. Rpt. [1932]*, pp. 47, 48, 49, 51, 55).—Progress is reported on agronomic research including variety tests with bentgrasses for permanence and seed production, silage corn, and peppers; seed source trials with potatoes; breeding work with alfalfa; comparison of sodium nitrate and ammonium sulfate on lawns; effect of fertilizers on seed production of Rhode Island bentgrass; the fertilizer needs of grasses and red clover; a study of methods for measuring growing plants in situ; and methods of eradicating brush in pasture improvement.

[Agronomic studies in England] (*Jour. Natl. Inst. Agr. Bot.*, 3 (1932), No. 2, pp. 142-201).—Research with field crops reported on included variety trials

with spring oats (1931), and mangels and swedes (1929-31), all by W. H. Parker, and with sugar beets (1931), by S. F. Armstrong; tests of the bread-making quality of wheats harvested in 1931, by A. and S. Humphries and L. H. Read; and the Lord Derby Gold Medal potato trials (1931), by W. H. Parker and H. Bryan. The reports of the Potato Synonym Committee for 1931 and 1932, by R. N. Salaman et al., and decisions of the Cereal Synonym Committee on varieties of wheat, oats, and barley are also included.

Crop investigations on peat lands, H. K. HAYES, A. C. ARNY, H. K. WILSON, and L. POWERS (*Minnesota Sta. Bul.* 292 (1932), pp. 32, figs. 3).—Continued experiments on peat lands (E.S.R., 55, p. 527) showed the productive varieties of cereal and seed crops to include Minrus, Iowar, and North Dakota Station selections from Green Russian oats; Peatland and Manchuria barley for grain and Trebi for feed; Rosen, Swedish, and Dakold rye; Redwing flax; Rustler and Minnesota No. 13 corn; Minsoy soybeans; Robust and Brown Swedish field beans; and Golden Vine field peas. Wheat did not appear to be suitable for peat soils. In general, the same varieties are recommended for peat as for mineral soils.

The comparative acre yields and production of digestible nutrients by the several crops are discussed in some detail. Estimated acre values, based on average prices for 1921-30 in the three months of intensive marketing and on oat yields, are for corn, \$22.64; winter rye, \$20.17; flax, \$19.02; winter wheat, \$15.42; barley, \$12.69; oats, \$12.16; durum wheat, \$10.50; and spring wheat, \$8.11.

Crop investigations on sandy lands, H. K. HAYES, A. C. ARNY, H. K. WILSON, and L. POWERS (*Minnesota Sta. Bul.* 291 (1932), pp. 30, figs. 2).—Leading varieties in tests conducted on the Coon Creek Sand Experimental Fields from 1919-32, included Minota oats, Ceres spring wheat, Minturki winter wheat, Swedish rye, Peatland and Trebi (for feed) barleys, Rustler and Minnesota No. 13 corn, Minsoy and Chestnut soybeans, and Robust beans. Field peas for seed and flax appeared undesirable for sandy lands.

The acre yields and production of digestible nutrients by the several crops are compared and discussed. The estimated average acre values were for rye, \$13.14; spring wheat, \$11.45; winter wheat, \$11.01; corn, \$10.92; durum wheat, \$10.59; flax, \$8.95; oats, \$8.32; and barley, \$6.82.

Tillage practices for southwestern Kansas, R. L. VON TREBRA and F. A. WAGNER (*Kansas Sta. Bul.* 262 (1932), pp. 17, figs. 2).—Results of experiments on seed bed preparation for row crops and winter wheat, planting sorghums, and the merits of fallow for row crops, carried on dry land for various periods at Garden City, in cooperation with the U.S. Department of Agriculture, are interpreted for farmers in southwestern Kansas. Methods for the control of soil blowing are indicated briefly. The information has largely been noted earlier (E.S.R., 58, p. 129; 64, p. 826).

The most important method of conserving soil moisture is timely and proper cultivation to suppress weeds. Fall or early spring breaking of the soil for row crops was found preferable to late spring breaking. Planting in furrows of medium depth appeared best for listed row crops. The sorghums produced higher average annual yields when planted with furrow openers on a surface planter than when listed. The data showed that kafir and milo should be planted as near June 1 to 10, and feterita as near June 15 to July 1 as soil and weather conditions will permit, whereas forage sorghums may be planted up to June 15 or 20 and maximum yields obtained. The optimum date for seeding wheat over a period of years was found to be between September 20 and October 10. Compared to the best method of continuous cropping, fallow

increased the average yield of kafir 77 to 92 percent, milo 75 percent, sorgo forage 77 percent, and wheat 87 percent. The authors point out that fallow stabilizes farm incomes by making possible the production of a crop in dry years when crops fail on continuously cropped land.

Corn and soybeans for silage, R. G. WIGGANS (*New York Cornell Sta. Bul.* 548 (1932), pp. 36, figs. 3).—Experiments covering the period 1922–31 included comparisons of corn and soybeans grown alone for silage, of corn v. various combinations of corn and soybeans grown in alternate rows and in the same row, and tests of varieties of soybeans for combination and of the effect of corn on the growth of soybeans. Conclusions based on the results and held applicable to similar conditions may be summarized as follows:

Good soybean varieties, grown alone in cultivated rows at the same spacing as corn, will produce from one half to three fourths as much green weight and from 65 to 80 percent as much dry weight as corn. The fact that soybeans and corn grown alternately in 2-row blocks give from 15 to 20 percent less green weight and from 7 to 15 percent less dry weight than corn grown alone makes this practice of questionable value. About one half this loss occurred with one row of soybeans and 2 rows of corn grown alternately, and the latter method of culture gives a ratio of corn to soybeans approaching very closely that recommended for silage, 3:1. A combination of corn at the optimum rate for silage, one stalk every 9 in. with three times as many soybean plants in the same row, will average significantly more total dry weight than corn alone, and the ratio of corn to soybeans in the silage will approximate the recommended proportion. Any combination of the two crops will reduce the corn yield and the proportion of grain in the corn. The loss of grain in the corn will not be made up by the grain in the soybeans. The effect of soybeans on corn in the combination is somewhat in proportion to the size of the corn, i.e., the smaller the corn the greater is the percentage reduction in corn and the greater the proportion of soybeans. Indications were that any of several varieties of soybeans growing in the same row with a good silage corn will increase the total dry-weight production. The total digestible nutrients produced on a unit area are increased, while the nutritive ratio is materially narrowed by the combination of the crops.

Inoculation of legumes, W. A. ALBRECHT (*Missouri Sta. Bul.* 322 (1933), pp. 8, figs. 4).—Essentially a revision of Bulletin 282 (E.S.R., 63, p. 225).

Some factors affecting the palatability of pasture plants, A. B. BEAUMONT, R. E. STITT, and R. S. SNELL (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 2, pp. 123–128).—When milk cows were allowed to graze selectively over plats of four species of plants grown under differential fertilizer treatments at the Massachusetts Experiment Station, they selected the species in the order of white clover, timothy, redtop, and Kentucky bluegrass. Where eight grasses were grown under uniform fertilizer conditions the order of selection was timothy, redtop, Italian ryegrass, English ryegrass, yellow oatgrass, meadow fescue, red fescue, and reed canary grass, the last two being hardly touched. This order of choice prevailed when the grass was 4 to 6 in. high, while little discrimination was shown when it was 2 to 4 in. high, suggesting that stage of growth is a factor affecting palatability.

In the first year after seeding practically no difference in palatability could be attributed to difference in fertilizer application, but second-year grass which had received nitrogen and minerals was grazed more than that receiving only minerals or no fertilizer. Grass which received high nitrogen appeared to be slightly more palatable than that which received medium or low quantities. When toughness of grasses was determined by breaking or cutting the individual

blades of grass, red fescue and Kentucky bluegrass proved significantly tougher and also less palatable than timothy and reedtop. However, reed canary grass, one of the least palatable, was the least tough.

Barley production in North Dakota, T. E. STOA (*North Dakota Sta. Bul.* 264 (1933), pp. 39, figs. 5).—General information is given on the production of barley in the State, the climatic and cultural requirements of the crop, and on its utilization commercially as food and feed for livestock, its feeding value, and on seed treatment for control of smut. The results of variety tests (E.S.R., 53, p. 232) in the State, in some places in cooperation with the U.S. Department of Agriculture, are reported in some detail, and the results of feeding trials at the station with steers and pigs are summarized. The origins, agronomic characteristics, and behavior are given for 18 of the varieties studied.

Manchuria (N.D. 2121) barley was used as the standard of comparisons. The Manchuria-Oderbrucker type, the oldest and perhaps the most widely grown 6-row barley, is preferred by maltsters. Trebi, since its introduction, has been outstanding in yields, equaling or outyielding Manchuria in numerous field trials. It is not desirable for malting, however, either alone or in mixtures. Velvet, a satisfactory malting barley, and Glabron, less desirable for the purpose, averaged about the same in yield as Manchuria. Two-row barleys, generally later maturing than the 6-row sorts, are not grown to any extent in North Dakota, although giving substantial yields. Hull-less and hooded barleys usually yield so much less than standard hulled awned varieties that they are not recommended unless particularly desired.

Anatomy and microchemistry of the cotton seed, R. G. REEVES and C. C. VALLE (*Bot. Gaz.*, 93 (1932), No. 3, pp. 259-277, figs. 21).—Observations made in the course of studies at the Texas A. and M. College on seed of varieties of American upland cotton, principally Mebane, and on seed of Pima and Sea Island cotton may be summarized as follows:

The seed of cotton is composed of the embryo, endosperm, and perisperm, the inner pigment, palisade (Malpighian), colorless, and outer pigment layers, and the epidermis, including lint hairs. Traces of starch, in addition to oil and protein, occasionally occur in the cells of both young and mature embryos. Substances commonly recognized as pentosans in the hulled seeds are located in the resin glands. Starch, oil, and protein occur within the cells of the endosperm. The cell walls of this tissue and of the embryo are composed chiefly of cellulose. Large quantities of starch found in the two integuments of the developing ovule disappear before maturity. Pigmentation, occurring in the cells of the two pigment layers and to a lesser extent in the palisade layer and epidermis, is associated with a hardening of the protoplast. The palisade layer is part of the inner rather than of the outer integument. The cell walls of the epidermis are composed chiefly of cellulose. Those of the perisperm and colorless layer become lignified before maturity. In the two pigment layers the walls appear to be composed of lignocellulose. The palisade layer of the seed coat contains cellulose and lignocellulose.

Results of cotton variety experiments, 1930-32, P. H. KIME (*North Carolina Sta. Agron. Inform. Circ.* 78 (1933), pp. [2]+4).—Recommendations based on further varietal trials (E.S.R., 64, p. 832) include certain strains of Mexican and Cleveland cotton for the Piedmont; of Cleveland, Mexican, and Farm Relief for the upper Coastal Plain; of Foster and Farm Relief for heavy and poorly drained soils in the lower Coastal Plain; and of Dixie-Triumph, Dixie, and Cleve-wilt cotton for wilt-infested soils. A table of percentages of different lengths grown in North Carolina showed that the

percentage of $\frac{15}{16}$ in. and longer cotton grown in 1932 was more than three times as large as in 1928.

Outlines of cotton culture in the San Joaquin Valley of California, J. W. HUBBARD (*U.S. Dept. Agr. Circ. 256 (1933), pp. 8, figs. 4*).—Practical information is given on selection of land and seed, time of planting, stands, chopping, cultivation, root development in relation to irrigation, effects of irrigation, and on ripening in early crops.

The effects of topping Egyptian cotton plants, J. TEMPLETON (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 103 (1931), pp. [1]+9, pls. 2*).—Topping Zagora Egyptian cotton plants in the seedling stage resulted in the production of a monopodium in the axil of each cotyledon, the larger appearing in the axil of the larger cotyledon, and the cotyledons grew larger and persisted much longer than normally. Topping before sympodia had started resulted in several monopodia, usually 1 in each of the 3 or 4 leaves carried at this time. In both cases flowering started later than in controls. When plants with sympodia were topped they were marked by vigorous growth and branching, a more erect position, and abnormally large and dark green leaves. When plants were topped at 3-week intervals from April 7 (seedling stage) to July 18, starting with the earliest toppings the yield fell off rapidly and then rose gradually with the later toppings, but in no case did topped plants yield as much as the controls.

Effect of rate of seeding upon comparison of varieties of oats, J. W. HOPKINS (*Canad. Jour. Res., 7 (1932), No. 1, pp. 1-50, figs. 6*).—The Abundance, Banner, and Daubeney oats varieties were sown at various rates in 1924, 1925, and 1926 at institutions in four Canadian provinces, with the object of obtaining a series of differences in yield between adjacent check and rate plats to be tested by Student's method. Each of 33 plats of a variety at each center consisted of nine drills 18.5 ft. long and usually 7 in. apart; the plat harvested was 1 rod long, with the two outside rows discarded. The number of plants and tillers in the central one of the remaining seven rows was determined, but the row was not used otherwise. The other six rows were harvested separately as two 3-row plats, so that each rate of seeding (four for each variety) occupied eight such 6-row plats, or sixteen 3-row plats.

The method of experimentation adopted was considered in the light of the principles of randomization and local control developed by R. A. Fisher. The plats sown at each rate were adequately replicated, but their systematic arrangement precluded a valid estimate of the errors in yield comparisons. The arrangement of the plats sown at different rates was shown to coincide to some extent with variations in soil fertility.

Differences in yield between plats of the same variety planted at different rates usually were small. The small-seeded Daubeney showed the greatest variations; the expected stabilizing effect of its greater tendency to tiller did not appear. The combined results indicated that the optimum seeding rate may not be the same for different varieties at the same station, and certainly not the same for the same variety at different stations. Near the optimum the effect of variations in seed rate upon yield were slight, and at three stations, all three varieties might be sown at a specified uniform rate without increasing significantly the ordinary experimental error. Large fluctuations found in the percentage stand of plants recorded, due partly to unavoidable errors in counting, indicated significant differences between the stations. At three stations the optimum stand of Daubeney may have exceeded that of the other oats, although the difference was significant at only one place.

Navarro oats, T. R. STANTON (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 2, pp. 108-112, fig. 1).—Navarro oats, found in cultivation in Navarro County, Texas, in 1919, and also known as Three Grain Mesh and Ferguson Navarro oats, is differentiated from other oats varieties by a distinct purplish bloom which covers the entire plant during heading and ripening, and an exceedingly short second floret rachilla segment. It is highly resistant to the smut of oats, including the physiologic races that attack red oats, but is susceptible to the oat rusts. The fact that certain plant characters of Navarro oats are more or less intermediate between varieties of *Avena sativa* and *A. byzantina* suggest a hybrid origin, although it apparently belongs to *A. byzantina*. Navarro has produced rather low yields of grain from both fall and spring seeding, and cannot be recommended for growing on farms. Nor is it especially resistant to cold, although it survived most winters at Arlington, Va. Indications are that it will be most useful in breeding for smut resistance in red oats.

The relative response of potatoes to different fertilizer elements, T. E. ODLAND (*Amer. Potato Jour.*, 10 (1933), No. 2, pp. 27-31).—Rotation and fertilizer experiments (E.S.R., 64, p. 132) at the Rhode Island Experiment Station showed that potatoes can be grown satisfactorily in such rotations without using stable manure. A fertilizer relatively high in potassium without excessive nitrogen seemed desirable. Variations in the quantity of phosphorus did not influence potato yields as much as did variations in nitrogen or potassium. Different potassium sources were about equally effective. Superphosphate and basic slag were better sources of phosphorus than rock phosphate and bone meal. Response to magnesium was observed on plats where little or no lime had been used, especially if liberal quantities of potassium and nitrogen had been applied.

Results of five years' fertilizer experiments with Irish potatoes in eastern North Carolina, C. B. WILLIAMS, H. B. MANN, and J. J. SKINNER (*North Carolina Sta. Bul.* 283 (1933), pp. 21, figs. 6).—Fertilizer experiments with potatoes made on Bladen fine sandy loam near Aurora, N.C., in cooperation with the U.S. Department of Agriculture during the period 1928-32, comprised studies of formulas, time of application, sources and quantities of potash and nitrogen, and ratios of inorganic to organic nitrogen.

On this soil 1 ton per acre of a well-balanced fertilizer applied at planting resulted in greater yields of potatoes than did smaller or larger quantities of fertilizer. Mixtures containing 6 to 7 percent phosphoric acid, 6 to 8 percent ammonia, and 5 to 6 percent potash proved most effective. Better returns were had from potassium chloride than other potash sources. Ammonium sulfate and sodium nitrate as nitrogen sources gave yields approximately the same, but generally lower than from mixtures of these salts with organic nitrogen carriers. Synthetic nitrogen salts compared favorably with sodium nitrate and ammonium sulfate, but likewise were not generally as effective as mixtures of inorganic and organic nitrogen.

With varying ratios of sodium nitrate or ammonium sulfate (inorganic) and cottonseed meal (organic nitrogen), best results were generally secured when the nitrogen was derived 65 percent from sodium nitrate and 35 percent from cottonseed meal or 80 percent from ammonium sulfate and 20 percent from cottonseed meal.

Sorghums for grain and forage, B. F. KILTZ, J. B. SIEGLINGER, W. M. OSBORN, B. F. BARNES, and H. H. FINNELL (*Oklahoma Sta. Bul.* [210] (1933), pp. 47, figs. 6).—Varieties of grain sorghum and of sorgo, and for certain areas specific production practices, are recommended for seven defined regions of

Oklahoma on the basis of extensive experiments conducted by the station at Stillwater and on outlying fields, by the Panhandle Station at Goodwell, and by the U.S. Department of Agriculture at Woodward and Lawton, Okla., and at Dalhart, Tex. Varieties of both types are described, and their comparative yields in the various tests are tabulated. General cultural methods and field and harvesting practices employed in growing the crop are outlined, and adaptations as to use, climatic conditions, soils, and insect pests are discussed.

[**Sugarcane research in Hawaii**] (*Assoc. Hawaii. Sugar Technol. Rpts.*, 8 (1929), pp. 111-170, 185-255, figs. 30; 9 (1930), pp. 65-147, 161-203, figs. 41; 10 (1931), pp. 3-97, figs. 20; 11 (1932), pp. 3-35, 51-140, figs. 59).—The reports of the eighth, ninth, tenth, and eleventh annual meetings of the Association of Hawaiian Sugar Technologists, held at Honolulu in October 1929, 1930, 1931, and 1932, respectively, contain a number of papers of interest to agronomists.

The 1929 report comprises Increasing Yields and Maintaining Juice Qualities, by R. Conant (pp. 111-117); Variety Problems of Arid and Unirrigated Plantations, by E. E. Naquin (pp. 119-123); Seedlings, by J. L. Nicoll (pp. 125-139); The Effect of Fertilizer on Root Distribution, by W. Wolters (pp. 141-159); Chemical Weed Control on Irrigated Plantations, by K. B. Tester (pp. 161-170); A Java Sugar Plantation, by W. W. G. Moir (pp. 185-195); Distribution of Factory Mud over Irrigated Fields, by F. W. Broadbent (pp. 197, 198); and Fertilizers, by G. R. Stewart et al. (pp. 199-255).

Papers presented at the 1930 meeting included The Reduction of the Trash Content of Harvested Cane, by W. Wolters (pp. 65-81); Soil Preparation—Plowing, etc., by J. L. Nicoll (pp. 83-102); Report of the Committee on Experimental Technique, by R. J. Borden (pp. 103-114); Pre-harvest Sampling of Cane, by F. W. Broadbent (pp. 115-117); Points on Cane Ripening, by O. H. Lyman (pp. 119-126); Studies on the Response of Cane Growth to Moisture, by H. R. Shaw (pp. 127-147); Seedlings, by A. J. Mangelsdorf (pp. 161-174); and The Plant Food Problem, by W. W. G. Moir (pp. 175-203).

The following papers are included in the 1931 report: Cane Disease Control through Adjustment of Plantation Practices, by J. P. Martin (pp. 3-11); Cane Cultivation on the Unirrigated Districts of Hawaii, by G. Ross (pp. 13-18); Five Studies of Experimental Technique, by R. J. Borden (pp. 19-30); Whys and Wherefores of Plowing and Planting, by S. L. Austin (pp. 31-33); Weed Control, by J. D. Bond (pp. 35-43); Progress Report on Mitscherlich Pot Method of Testing Soil Fertility, by D. A. Cooke (pp. 45-55); Response to Forms and Time of Fertilization, by W. W. G. Moir (pp. 57-70); Benefits Derived from Field Experiments on Unirrigated Plantations, by E. E. Naquin (pp. 71-83); Root Pressure of the Sugar Cane Plant in Relation to Soil Moisture, by D. M. Weller (pp. 85-91); and Fertilizer Practices and Problems on Unirrigated Plantations, by W. C. Jennings (pp. 93-97).

The 1932 report embraces articles on Cultivation of Ratoons under Unirrigated Conditions on Kauai, by W. P. Alexander (pp. 3-30); Cultivation on Unirrigated Plantations on the Island of Hawaii, by R. Bryan (pp. 31-35); A Discussion of Some Problems in Variety Work and a Summary of the Newer Varieties of Promise, by C. G. Lennox (pp. 51-57); The Puerto Rican Sugar Industry and the Fourth Congress of the International Society of Sugar Cane Technologists, by W. W. G. Moir (pp. 59-70); Determining the Irrigation Requirements of Sugar Cane and Adjusting Field Practice to Meet These Requirements at Honolulu Plantation, by R. Penhallow (pp. 71-98); Progress in Plant Nutrition Studies, by F. E. Hance (pp. 99-109); Methods of Applying Fertilizers, by G. W. Fisher (pp. 111-116); and Short Cropping on Unirrigated Plantations, by W. C. Jennings (pp. 117-140).

The composition of the spring growth of sweet clover as influenced by previous fall treatment, C. J. BADGER and H. J. SNIDER (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 2, pp. 105-108).—The influence of removing a fall hay crop upon the composition of sweetclover the following spring at about the stage of growth when it is usually plowed under as green manure was studied by the Illinois Experiment Station. Analysis of the tops and roots showed that removal of the fall growth reduced the total dry matter, total nitrogen, phosphorus, and potassium in the following spring growth. Cutting for fall hay appeared to reduce the vitality or winter resistance of the sweetclover plants, which was reflected in a thinner stand and a less vigorous spring growth.

Sweet clover as a soil improvement crop for orchards, O. W. DAVIDSON (*New Jersey Stas. Circ.* 269 (1933), pp. 4).—Brief statements on the value of sweetclover for soil improvement and green manure in orchards, on its cultural needs, and on the production of green material and total nitrogen and the availability of its nitrogen, are based largely on results of experiments made at New Brunswick.

[Tobacco research in Connecticut] (*Connecticut State Sta. Bul.* 347 (1933), pp. 280, 281).—Experiments with tobacco (E.S.R., 67, p. 383), continued at the Tobacco Substation at Windsor and reviewed briefly, comprised tests of sources of potash (E.S.R., 67, p. 381), use of stable manure on shade tobacco, curing shade tobacco under controlled temperature and humidity and shed conditions, study of nitrification of nitrogen carriers, and control of potato flea beetle on tobacco with barium fluosilicate.

The distribution of nitrogen in tobacco when the supplies of nitrogen and of light are varied during the growing period, W. S. EISENMENGER (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 3, pp. 255-265).—Havana seed tobacco plants were grown for one month in water cultures in a greenhouse at the Massachusetts Experiment Station. Half of the plants were then removed to a dark room and half were continued in the light. Sodium nitrate was supplied continuously to half of each group and withheld from the other half for 11 days before harvest.

Analyses for various nitrogen fractions showed the stems to be relatively richer in total nitrogen and ammonia than were the other plant parts, while the leaves were characterized by a relatively high content of dry matter and protein. Plants without a nitrogen supply for 11 days maintained an ample supply of nitrate nitrogen in the tissue. Those grown in the dark contained a higher percentage of nitrate nitrogen than corresponding plants grown in the light. Plants liberally supplied with nitrate nitrogen with a disproportionately low supply of other nutrients contained a low percentage of dry matter and a high percentage of nitrate nitrogen, indicating a low metabolic rate. The nitrate and alpha-amino acid nitrogen content of the plants seemed to be influenced most by light, darkness usually increasing the percentage of nitrogen. The maximum percentage of nitrate nitrogen in all cases was found in the midvein of the leaf, suggesting that considerable reduction of nitrogen occurred in or near the veins of the leaf.

Spring wheat varieties for North Dakota, T. E. STOA (*North Dakota Sta. Circ.* 46 (1932), pp. 20, figs. 4).—Varieties of spring wheat are recommended for different sections of the State on the basis of extensive tests by the station and the U.S. Department of Agriculture, working in cooperation and independently. The history and agronomic characteristics of important varieties, the milling and baking values of common wheats and the macaroni value of durumms, and the suitability of different varieties for combine harvesting

are described with remarks on standardization of varieties and on diseases of wheat and their control.

Marquis, the standard hard red winter wheat, currently most commonly grown and preferred by buyers of bread wheat, is susceptible to stem rust, and should be produced in sections where possibilities of rust injury are small. Ceres, the outstanding and most promising wheat of this class, which generally outyielded Marquis in extensive tests, is moderately resistant to stem rust, more susceptible than Marquis to bunt and loose smut, is more drought resistant, and resembles Marquis in milling and baking characters, is indicated particularly for eastern North Dakota when a hard red spring variety is wanted and to replace Marquis where it is unsatisfactory. Marquillo and Hope were more resistant to stem rust, leaf rust, and bunt than Marquis, but were not so satisfactory in yield and certain other characters. Reward, the most promising early wheat, averaged below Marquis in yield. Of the leading high quality durums, Kubanka is more resistant to rust and drought, although Mindum yields higher under normal conditions. Monad and Pentad are very rust resistant but unsatisfactory for macaroni.

Wheat varieties for the Columbia River Basin of Oregon, D. E. STEPHENS, R. B. WEBB, and J. F. MARTIN (*Oregon Sta. Bul. 308 (1932), pp. 37, fig. 1*).—The yields of winter and spring wheat varieties are reported from field-plat and nursery trials at the Moro and Pendleton Substations and nursery trials at six other points in the Columbia River Basin, conducted in cooperation with the U.S. Department of Agriculture.

Hybrid 128 and Turkey, C.I. No. 1571, made the highest average yields of the winter wheats in plat trials for long periods at Moro, while Hybrid 128 × Fortyfold (C.I. No. 10066) and North Powder, a Turkey selection, averaged highest during recent years. Federation, Hard Federation, Onas, and White Federation led the spring wheats in field plats. In the Moro nursery trials, White Odessa and Federation from fall seeding yielded highest over a long period. Selections from Fortyfold × Federation and Arcadian × Hard Federation averaged highest since 1926, and Federation, Currawa, Onas, and White Federation led the spring wheats.

At Pendleton, Federation averaged highest on the winter wheat field plats, and was followed by Fortyfold × Federation (C.I. No. 8247), which yielded highest in nursery trials. Their high yield and smut resistance made promising two other newer hybrid selections, Hard Federation × Martin and White Odessa × Hard Federation. Federation, the leading wheat variety in eastern Oregon, and Onas yielded highest in the spring wheat nursery and plats.

Selections from Fortyfold × Federation, Fortyfold × Hard Federation, and Arcadian × Hard Federation usually produced the highest yields in all winter wheat nurseries during the last four years. It is held that these early maturing high-yielding wheats, when further improved for hardiness and smut resistance, should replace other varieties in the Columbia River Basin. The wheats of the Turkey type tested higher in weight per bushel than did the hybrid selections. Oro and Rio, highly smut-resistant, pure-line selections from Turkey, distributed to farmers, seemed likely to replace other hard red winter wheats in areas where they are now grown. Onas, Federation, White Federation, and Hard Federation produced the highest yields as spring wheats.

Report of seed analyses, 1932 (*Penn. Dept. Agr. Bul. 515 (1933), pp. 61*).—The germination, purity, and weed seed content are tabulated for about 1,540 samples of agricultural seed collected in Pennsylvania during 1932.

Official Seed Testing Station for England and Wales: Thirteenth annual report, 1929–1930, A. EASTHAM (*Jour. Natl. Inst. Agr. Bot., 3 (1932)*),

No. 2, pp. 202-217, figs. 2).—The average germination and purity of 23,477 samples of agricultural seed, received from different sources in these countries during the year ended July 1930, are tabulated and discussed, and examination questions on the principles and practice of seed testing are appended.

HORTICULTURE

[**Horticulture at the Connecticut State Station**] (*Connecticut State Sta. Bul.* 347 (1933), pp. 273, 278, 279).—A brief report is given upon the results of the examinations of samples of vegetables, including celery, lettuce, cabbage, and string beans, and of apples for arsenical residues. The results of breeding work with sweet corn, beets, and strawberries are briefly discussed, together with the results of strain tests of New York lettuce.

[**Horticulture at the Florida Station**], R. W. RUPRECHT, G. H. BLACKMON, H. MOWRY, M. R. ENSIGN, A. F. CAMP, A. L. STAHL, L. W. GADDUM, J. H. JEFFERIES, W. E. STOKES, and R. V. ALLISON (*Florida Sta. Rpt.* 1932, pp. 59-63, 64, 96-112, 118-127, 158-163, 174-176, 184-187, 213-217, figs. 10).—Among studies upon which reports are made are the effect of potash on the composition and yield of citrus trees; the fertilizer and rootstock requirements of the Satsuma orange; the effect of the source of potash on the citrus crop; the fertilizer requirements of citrus trees grown on muck soil; the composition of pecan nuts as influenced by fertilization and soil types; the effect of various fertilizer formulas on citrus production; the use of concentrated fertilizers for citrus; the response of pecans to soil type and locality; the use of fertilizers and cover crops in pecan orchards; variety and stock trials with pecans and walnuts; cracking and cold storage trials with pecans; variety tests of grapes; cultural and fertilizer trials with tung-oil trees; varietal trials with plums, apples, and other fruits and various ornamentals; the grading and packing of Florida produce; strain and variety tests with vegetables at Sanford; the fundamental physiology of citrus fruit production; avocado maturity studies; the relation of nitrogen absorption to food storage and growth in the pecan; the preservation of citrus juices and pulps; and the cold storage of citrus fruits.

Miscellaneous propagation, varietal, fertilizer, and cultural trials with citrus are reported on from the Citrus Substation.

Among investigations reported from the Everglades Substation are tests of landscape and windbreak plants, peach, plum, avocado, and citrus, and various forest trees.

At the Subtropical Substation data are reported on fertilization of avocados and of truck crops and variety trials with vegetables.

[**Horticulture at the Georgia Station**] (*Georgia Sta. Rpt.* 1932, pp. 37, 38, 39-47, 48, 49, figs. 6).—Brief reports are presented on various activities, including studies on the preservation of fruits by freezing; factors limiting the longevity of peach trees; shipping containers for Georgia fruits; the effect of fertilizers on the germination of vegetable seeds; the value of the Austrian winter pea as a cover crop for vegetables; pecan propagation; the resistance of the tung-oil tree to winter injury; the effect of the March freeze of 1932 on various fruit crops; and the pruning of Muscadine grapevines.

In addition varietal and fertilizer trials with fruits and vegetables at the Mountain Substation are reviewed briefly.

[**Horticulture at the Kansas Station**] (*Kansas Sta. Bien. Rpt.* 1931-32, pp. 50-54, 120, 121).—Among studies herein reported are orchard investigations, including spraying, methods of pruning, soil management experiments, and varietal tests, by R. J. Barnett, G. A. Filinger, and W. F. Pickett; small fruit

investigations, by Barnett; flower and vegetable investigations, by W. B. Balch; forest tree investigations, by E. W. Johnson; and variety tests at the Fort Hays Substation with grapes and iris.

[**Horticulture at the New Mexico Station**] (*New Mexico Sta. Rpt. 1932*, pp. 59-66, 68-70, 72, 73, figs. 3).—In this progress report (E.S.R., 67, p. 35) there are set forth the results of the effect of spring freezes on the set of fruits; of variety tests with pecans; of the effect of soil type and of plant protectors on the yield of several varieties of tomatoes; of fertilizer trials with cabbage; of fertilizer, irrigation, and general cultural and breeding trials with onions; and of irrigation trials with beans.

[**Horticulture at the Rhode Island Station**] (*Rhode Island Sta. Rpt. [1932]*, pp. 47, 48, 53, 54, 55, 56).—Results are briefly presented of variety studies with sweet corn; sulfate of ammonia v. nitrate of soda trials with ornamental shrubs; breeding lettuce and eggplant; fertilization of greenhouse crops of tomatoes (E.S.R., 68, p. 476); winter gladiolus culture; fertilizer experiments with grapes; the grafting of vinifera grapes; and blackberry breeding.

The High Plains farm garden, F. P. ESHBAUGH ([*Oklahoma*] *Panhandle Sta., Panhandle Bul. 48* (1933), pp. 14).—Information is presented on the planning, planting, and care of the vegetable garden, with notes on various crop plants and varieties thereof. In a test of cucumber varieties the Arlington White Spine was most productive in 1929 and 1930. Mulching with straw made possible the production of a partial crop of Irish potatoes.

The quality of vegetable seeds on sale in New York in 1932, M. T. MUNN (*New York State Sta. Bul. 618* (1933), pp. 46, figs. 2).—In confirmation of earlier reports (E.S.R., 67, p. 130) herein is presented, largely in tabular form, the results of the examination, purity analysis, germination test, and field performance of 1,004 samples of packet and bulk vegetable seeds purchased in the open markets of New York State during the planting season of 1932. Seed of the same kind and variety varied widely as to freedom from weed seed and inert matter and germinating capacity. The field tests made from 622 of the packets showed wide differences in quality, from a capacity to yield excellent crops to others showing little if any care in breeding, harvesting, and packaging.

The results of spray residue studies on vegetables in 1932, H. C. McLEAN and A. L. WEBER (*N.J. State Hort. Soc. News, 14* (1933), No. 3, pp. 490, 491).—In this report on spray residue activity in New Jersey, the authors state that severe trimming of the outer leaves reduced the arsenical residue of cabbage and cauliflower below the prescribed tolerance, although originally carrying an excess. In cauliflower the residues were found to be largely located at the junction of the leaves with the main stem, and no residues were found on the flower parts. The later the plants were sprayed or dusted the more leaves and stalk that had to be removed to meet requirements.

Study of the life history of Brassica oleracea, O. H. PEARSON (*Bot. Gaz., 94* (1933), No. 3, pp. 534-550, figs. 16).—At the California Experiment Station it was found in studies with cauliflower, broccoli, and cabbage that the inflorescence is typically racemose, although sometimes paniculate. Anthesis was brought about by the rapid growth of petal and filament, which forced apart the sepals, exposing the anthers and stigma. Pollination was accomplished by insects.

The haploid number of chromosomes in the pollen mother cell was 9. Pollen grew readily in 20 percent sucrose solution at 15° to 20° C. Viability was maintained satisfactorily for 7 days at 11°, while at 4° and 30° viability was lost on the third and second days, respectively.

The embryo did not develop noticeably for at least 4 days after fertilization, grew slowly at first, and did not fill the ovule until about the thirty-second day. However, seeds planted within 33 days after pollination germinated and grew.

Materials for temporary home storage of celery, C. E. STEINBAUER (*Minn. Hort.*, 59 (1931), No. 9, p. 216; *abs. in Minnesota Sta. Rpt. 1932*, p. 34).—Of six substances, namely, peat, shavings, loam soil over concrete blocks, sand, loam soil, and half sand and half peat, used for packing about the roots of stored celery, peat was the most successful, with shavings giving fairly good results.

A comparative test of some pepper varieties, A. E. HUTCHINS (*Minn. Hort.*, 60 (1932), No. 5, pp. 104, 121; *abs. in Minnesota Sta. Rpt. 1932*, p. 31).—The results are presented of a test of 13 varieties of garden peppers with relation to yield, average number and weight of fruits per plant, and the weight and average thickness of flesh per fruit. Harris Earliest and Harris Early Giant were earlier and more productive than any of the other varieties.

The most important varieties of spinach [trans. title], N. NICOLAISEN (*Züchter*, 5 (1933), No. 1, pp. 1–8, figs. 16).—Technical descriptions are presented of 28 varieties of spinach studied in an attempt to establish standard types.

Effects of fertilizers and rotation on earliness and total yields of tomatoes, C. B. SAYRE (*New York State Sta. Bul.* 619 (1933), pp. 50, figs. 5).—The results of experiments continued over a period of six successive seasons led to the conclusion that phosphorus was the most important nutrient in increasing the early and the total yields of tomatoes. Nitrogen was second and potash third in importance, the latter substance returning a profit when used in connection with adequate quantities of nitrogen and phosphorus. The best form in which fertilizers were applied was a complete mixture high in phosphorus. With respect to effect on yield, moderately high analysis fertilizers compared favorably with strongly concentrated materials when judged from the standpoint of equivalent amounts of actual plant food. Manure was found to be an excellent fertilizer but was improved by the addition of a complete fertilizer high in phosphorus or available phosphorus alone.

Yields with any given variety and treatment varied greatly from year to year, due apparently to variations in temperature, rainfall, and the frost-free period. The following 4-year rotation proved very satisfactory for the tomato crop: First year, tomatoes followed by rye; second year, snap beans followed by rye; third year, beets; and fourth year, cannery peas followed by sweetclover.

Decoloration, ripening, and coloration of tomatoes with ethylene gas, R. B. HARVEY (*Minn. Hort.*, 59 (1931), No. 8–9, p. 189).—Green tomatoes are said to contain two green pigments known as chlorophylls and two yellow pigments, carotene and xanthophyll. In yellow varieties, with ripening the green pigments are lost, leaving the characteristic yellow color. In red varieties, coincident with the loss of green there develops a red pigment called lycopin, of the same empirical chemical formula as carotene. Upon exposure of immature tomatoes to ethylene, chlorophyll decomposition is hastened and ripening speeded. At temperatures above 32° C. (89.6° F.) red coloration fails to occur, but if such fruits are removed to a lower temperature, 20° to 30°, they form red pigment and within 5 days take on a normal color. Evidently the mechanism for the production of lycopin is not effective at temperatures above 32° but is not destroyed.

Artificial refrigeration as a means of studying winterhardiness, R. B. HARVEY (*Jour. Amer. Soc. Agron.*, 23 (1931), No. 12, p. 1064; *abs. in Minnesota Sta. Rpt. 1932*, p. 28).—Long experience with the artificial winter test indicated that it was the most reliable method of estimating the rate of hardening and the hardening capacity of plants.

Hardiness of tree fruits and the artificial winter test, R. B. HARVEY (*Minn. Hort.*, 60 (1932), No. 1, p. 18).—Discussing hardiness in plants, the author states that hardiness of plant tissues can be determined quickly by exposing the tree or branches thereof in a refrigerated space. Two hours at the freezing point daily for 5 days sufficed to harden plants, even though the remaining hours were warm. The limit necessary to maintain hardiness was about 1 hour at the freezing point in each 48 hours at 65° F. Only the progeny of hardy plants possessed the ability to acquire hardiness.

Methods used to breed new varieties, R. WELLINGTON (*Minn. Hort.*, 61 (1933), No. 5, pp. 83–85, figs. 8).—Illustrating the various steps employed at the New York State Experiment Station in the development of new fruits, the author describes certain of the resulting apple, raspberry, and strawberry seedlings and discusses the organization used for disseminating promising seedlings to the growers.

Fruitfulness in pomological plants, J. V. NATIVIDADE (*A Improdutividade em Pomologia. Alcobaca, Portugal: José de Oliveira, Jr., 1932, pp. 229, pls. 50, figs. 98*).—Supplemented by an extensive survey of pollination studies in various parts of the world, the author presents results of histological and cytological studies with various Portugal-grown fruits. Differentiation of flower buds was first observed in the Bismarck apple at the end of June and in the Casa Nova de Alcobaca the first days of July, with the first indication of anther differentiation on January 15 and February 10, respectively. The haploid number of chromosomes in the pollen mother cells of the Molar Fina almond, Comum apricot, Branco-rosa peach, and Galega, Vidrada, and Saco cherries was 8, with 24 in the Reine Claude plum and 12 in the Garrafal cherry, *Prunus avium* × *P. cerasus*. In the Reine Claude plum (hexaploid) meiosis proceeded with great irregularity due to polyploidy. In the apple there were distinguished two important groups (1) varieties with 17 haploid chromosomes, and (2) a group with a diploid number of 51 and marked irregularity in the reduction divisions.

Pollination of fruit trees in West Virginia, H. E. KNOWLTON (*West Virginia Sta. Circ.* 62 (1933), pp. 12, figs. 9).—Information is presented on the processes and need of pollination in fruits, on sterility and its causes, and on the problem as related to apples, peaches, cherries, plums, and pears. Suggestions are made for the provision of adequate pollination by the interplanting of compatible varieties, introduction of bouquets of compatible bloom, and the use of bees. The relation of nutrition to the set of fruit is pointed out.

Spraying fruit plants, W. F. PICKETT and G. A. FILINGER (*Kansas Sta. Circ.* 169 (1932), pp. 34, figs. 21).—In this revision of an earlier circular (E.S.R., 61, p. 141), there is presented information on diseases and insects, their nature and importance, supplemented with spray schedules and other suggestions for control. In the case of crown gall and orange rust of brambles, diseases not susceptible to control by spraying, the authors suggest that care should be exercised to secure disease-free plants.

Success and failure in spraying for scab and codling moth, G. L. RICKS and W. TOENJES (*Michigan Sta. Spec. Bul.* 230 (1933), pp. 32, figs. 22).—Studies in representative commercial orchards in Allegan and Van Buren Counties showed that certain growers are much more successful than their neighbors in controlling apple scab and codling moth. An analysis of the situation indicated that thoroughness of coverage rather than differences in spraying schedules or in materials used was the principal factor concerned. In the average orchard more scabby and wormy fruits were found in the upper than lower halves of the trees, due obviously to the fact that the lower portion was

covered more thoroughly. Unless trees in heavy foliage were sprayed so that the material passed beyond the center of the tree, fruits were often coated on one side only and subject to codling-moth invasion. Where trees were thoroughly covered with spray the codling moth population was greatly reduced in one season, especially if the applications were timed with bait trap records. Concluding, the authors assert that successful spraying depends more on the individual operating the spray gun than on any other single factor.

Rapidly growing, succulent branches on young apple trees tend to form narrow crotch angles with the trunk, M. A. BLAKE (*New Jersey Stas. Circ.* 270 (1933), pp. 4, figs. 2).—Stating that branches which join the trunk at angles of less than 40° are likely to be weak at the junction, the author presents some data taken on 1-year-old Stayman Winesap trees which showed that spurs and branches 6 in. or less in length formed angles with the trunk averaging 83.8° , whereas 1-year-old branches 31 to 36 in. in length formed crotch angles averaging 47.1° . The disbudding of 1-year-old apple trees at planting to a few selected buds tended toward the formation of acute angles. Furthermore, in the case of disbudded 1-year-old Delicious trees the treated trees made much less growth the season of disbudding than did the control trees.

Assimilation of carbon dioxide by apple leaves under natural conditions, A. J. HEINICKE (*Amer. Jour. Bot.*, 19 (1932), No. 10, p. 845).—Studies at Cornell University showed a marked fluctuation in the hourly and daily rate of photosynthesis of apple leaves. The highest rate in over 1,000 determinations during 1- to 5-hour periods was 35 mg of carbon dioxide per hour per 100 cm² of leaf surface, with the most common rate between 5 and 10 mg. As a rule more carbon dioxide was absorbed in the morning than in the afternoon, but high values sometimes occurred a few hours before sunset. Under certain conditions spraying and ringing, although not visibly affecting the leaf surface, greatly reduced photosynthesis. The apparatus used was previously described (E.S.R., 68, p. 744).

A study of the ash constituents of apple fruits during the growing season, E. F. HOPKINS and J. H. GOURLEY (*Ohio Sta. Bul.* 519 (1933), pp. 30).—Having reported in an earlier paper (E.S.R., 65, p. 833) that applications of quickly available nitrogen increased both the percentage of total nitrogen and also the actual amount of nitrogen in apples but had no apparent direct effect on keeping quality, the authors herein discuss the results of ash analyses of the flesh of apples and the possible correlation of the percentages of various constituents with the amount of breakdown in such fruit when placed in common or cold storage.

Evidence was secured that with increasing size or maturity of apples the percentages of total solids and of ash decrease and also the percentages of calcium, phosphorus, potash, and iron based on both dry and moist weights. Mineral constituents actually continued to be absorbed by the fruit during development but at a rate that was slow in comparison with the rate of increase in size. As fruit increased in size the percentage of calcium was found to decrease rapidly, that of phosphorus less rapidly, and potash to increase. Fertilizers containing potassium, especially when deficient in phosphorus, caused an increase in the percentage of total ash and in the amount of potash in the ash. At the same time the percentages of calcium and phosphorus in the ash were low, indicating that the greater intake of potash resulted in a decreased intake of certain other elements. In general a high ash content was associated with a high percentage of potash in the ash. Of the six varieties studied, namely, Stayman Winesap, Winesap, Grimes Golden, Arkansas Black, Jonathan, and McIntosh, the last named was markedly dis-

tinct, being exceptionally low in ash and calcium and high in phosphorus. The soil in which the trees were growing apparently influenced the composition of apples to some extent.

Observations on stored fruit showed no close relationship between physiological breakdown and either the nitrogen content of the fruit or the mineral content of the ash, but it is pointed out that the results may have been influenced somewhat by soil type. As noted at the station, variety and season were factors in breakdown. In years of light crops Rhode Island Greening, Stayman Winesap, Grimes Golden, and Baldwin were likely to manifest breakdown, and the trouble was accentuated by overfertilizing with manure or nitrogen. In fact any treatment inducing oversize of fruit tended toward the same result. A delay in storing and high storage temperature also tended to increase the percentage of physiological breakdown.

Embryo abortion in early-ripening varieties of *Prunus avium*, H. B. TUKEY (*Bot. Gaz.*, 94 (1933), No. 3, pp. 433-468, figs. 41).—In this contribution from the Hull Botanical Laboratory upon work carried out in part at the New York State Experiment Station, the author discusses the embryogeny of the sweet cherry with particular reference to the nature of embryo abortion, found to occur almost universally in early-maturing varieties. Apparently abortion occurred as a sudden arrest in development, with no indication that the phenomenon was associated necessarily with poor pollination, sterility, incompatibility, or even nutrition. Among cherries normally producing fruits with abortive embryos, the earliest ripening fruits contained the smallest embryos, a condition just opposite from that obtaining in late cherries.

As a practical deduction, the author concludes that early-ripening cherries should not be used as ovule parents in the origination of new varieties but that the crosses should be made in the reciprocal direction.

Artificial culture of sweet cherry embryos, H. B. TUKEY (*Jour. Heredity*, 24 (1933), No. 1, pp. 7-12, figs. 3).—At the New York State Experiment Station embryos of the Early Purple Guigne sweet cherry removed from the pits of ripe fruit on June 10, 26 days after full bloom, placed on a nutrient agar containing neither nitrogen nor carbohydrates and kept in direct sunlight in a constant temperature case failed to grow, despite slight swelling. In another instance, however, where glucose was added to the nutrient solution, chlorophyll was observed in the cotyledons within 5 days, followed by leaf and root development. The addition of amino nitrogen as well as glucose to the nutrient agar resulted in large green leaves but no roots. Nitrate nitrogen on the other hand did not inhibit root development. Comparable results were obtained with Burbank, Coe, and Governor Wood cherries.

Successful growth was also obtained with Coe and Governor Wood pits cut to expose the cotyledons to sunlight and pressed into sterile quartz sand in pots under bell jars. Seed of late-ripening varieties harvested in the period 40 to 50 days after full bloom germinated immediately. However, when such seed was allowed to develop further it failed to germinate until a period of afterripening at low temperature and high moisture was provided. Apparently the balance of reserve materials essential to induce dormancy was never reached in the aborted seeds of early-ripening cherries.

The author points out the value of the findings in practical cherry breeding, and the need of distinguishing between fruits which do not produce viable seeds because of genetically lethal factors and those like the early-ripening cherries in question which fail because of some adverse somatic relationship.

Prune maturity and storage, L. R. TUCKER and L. VERNER (*Idaho Sta. Bul.* 196 (1932), pp. 20, figs. 4).—Studies conducted in orchards in different localities

in southern Idaho (E.S.R., 63, p. 239) showed that maturity changes in the Italian prune are characterized by softening of the flesh, development of color pigments in the skin, and an increase in sugar and a decrease in acid content. When measured at a definite firmness fruit varied according to the orchard in which it was grown with regard to sugar and acid contents. A similar seasonal variation was observed for any given orchard. Firmness was found to be an apparently accurate measure of the keeping quality of stored prunes, which kept about as well in storage as they did on the tree under favorable weather conditions. At room temperature and humidity prunes softened quickly and shriveled badly, suggesting the desirability of prompt storage after picking. Other storage troubles were mold and internal breakdown, the former occurring especially abundantly where the skin was broken.

Growing raspberries in West Virginia, H. E. KNOWLTON and C. R. ORTON (*West Virginia Sta. Circ. 61* (1933), pp. 20, figs. 9).—A general discussion is presented, including information on the present status of the industry, the location of plantings, preparation of the soil, planting, pruning, culture, importance of organic matter, fertilization, harvesting, varieties, and control of diseases, such as crown gall, anthracnose, cane blight, orange rust, and mosaic.

Raspberry pruning studies, W. G. BRIERLEY (*Minn. Hort.*, 61 (1933), No. 4, pp. 65, 67).—In addition to reviewing earlier studies (E.S.R., 67, p. 39), the author includes observations on work carried on at the Fruit Breeding Farm of the Minnesota Experiment Station in 1932 wherein it was found that if old canes were removed from red raspberries immediately after fruiting the new canes grew a little faster and a little taller and matured a week later. It is deemed likely that the beneficial effect of the early removal of the old canes is largely a matter of water conservation and probably not related to the nutrient supply.

Observations and experiments with blueberries in western Washington, D. J. CROWLEY (*Washington Col. Sta. Bul. 276* (1933), pp. 20, figs. 7).—This is a general discussion of blueberry culture, including varieties, soil requirements, planting, pollination needs, pruning, fertilizers, propagation, and harvesting and marketing, supplemented by certain experimental results. Of fertilizers tested at the Cranberry Substation at Long Beach, a mixture of 100 lb. of nitrate of soda, 200 lb. of rock phosphate, and 50 lb. of sulfate of potash was found desirable and increased the yield almost twice that of the untreated plats the first season and more than 2.5 times in 1932. Applications of commercial fertilizer to blueberries less than 3 years old with a view to stimulating vegetative growth gave negative results.

In propagating softwood cuttings, consistently high percentages of rooting were obtained from the heel type of softwood cutting set out on May 26, June 15, and July 10, 1932. The percentage of rooting after the middle of July declined rapidly. The maximum rooting (95 percent) was obtained with heel cuttings set June 15 in a mixture of sphagnum moss and sand. Comparable cuttings in sand rooted 80 percent. Cuttings placed under cheesecloth or lath rooted as freely as those under glass. Sand used alone was difficult to handle because of its tendency to dry out rapidly during drought periods. The author points out that seedlings do not come true to seed and that they may be of little value even though the seed is harvested from cultivated varieties.

The composition of and nutrient uptake by the banana plant, with special reference to the Canaries, A. F. BAILLON, E. HOLMES, and A. H. LEWIS (*Trop. Agr. [Trinidad]*, 10 (1933), No. 5, pp. 139-144).—Studying the composition of Cavendish banana plants at the time of setting and after growth for about 18 months in brick lined pits, the authors conclude that the plants

took up from the soil a moderate amount of nitrogen, relatively little phosphate, and a very large amount of potash. The fertilizer applied was of the proportion 10.59-2.97-13.34 (N-P-K). The weights of potash in both the head and the mature plant were high. The fruit stalk was particularly high in percentage of potash and also relatively high in percentage of phosphate. The fruit was markedly deficient in percentage of lime, magnesia, and iron, most of the lime being located in the roots, stems, and leaves and most of the magnesia and iron in the roots and stems. Analyses made of the soil before and after the growing period showed a very high loss of potassium oxide from the soil, only 10 percent of which could be accounted for by the uptake by the plant. A similar condition was observed in respect to phosphorus. Presumably the potassium oxide was very rapidly leached out of the soil by the carbonated water.

Vicinism in *Aquilegia vulgaris*, E. ANDERSON and B. SCHAFER (*Amer. Nat.*, 67 (1933), No. 709, pp. 190-192).—In an experiment designed to determine the amount of outcrossing in *A. vulgaris*, no evidence was found of effective outcrossing with other species, but within the species outcrossing occurred in at least 19 of 119 possible cases.

Delphiniums: Their history and cultivation, G. A. PHILLIPS (*London: Thornton Butterworth*, 1933, pp. 256, pls. 18, figs. 18).—This book treats of the history and development of the delphinium in Great Britain, the Netherlands, France, Germany, and other European countries, and gives information on varieties, species, planting and cultivation, propagation, crossbreeding and hybridization, enemies and diseases, etc.

The book of the delphinium, J. F. LEEMING (*London: Isaac Pitman & Sons*, 1932, pp. IX+76, pls. 7, figs. 5).—A general treatise on the growing of the delphinium.

Water lilies and water plants, A. NIKLITSCHK (London: Chatto & Windus, 1932, pp. VIII+136, pls. 12, figs. 5).—A general discussion of water gardens and aquatic plants.

Commercial bulb growing: Bulbs and blooms for market (*London: Nurseryman & Seedsman*, [1933], pp. [5]+75+[2]).—A general discussion.

Preliminary report on reducing transpiration of transplanted evergreens, J. L. EMERSON and A. C. HILDRETH (*Science*, 77 (1933), No. 2001, pp. 433, 434).—At the U.S.D.A. Cheyenne Horticultural Field Station waxes, gums, resins, oils, and asphaltic compounds, alone and in various mixtures, were tested as coatings to reduce transpiration losses from young evergreens. It was found that safe temperatures were low; for example, Colorado blue spruce (*Picea pungens*) could not withstand materials heated above 65° C. (149° F.). Tests of nontoxic oils and emulsions showed castor and corn oils to be the only noninjurious materials when used in pure form. Emulsifying some of the injurious oils reduced or entirely eliminated their toxicity. On 5-year-old dormant *Pinus austriaca* trees the daily transpiration loss was reduced by corn oil spray from 20.7 to 2.4 g and by sulfonated linseed oil emulsion from 20.8 to 8.4 g, whereas in the control trees there was an actual increase in the same period, from 20.3 to 26.3 g. No detrimental effects of the sharply reduced transpiration were noted during the succeeding months.

Gardens of fragrance, T. G. W. HENSLOW (*London and New York: Frederick Warne & Co.*, 1932, pp. XVI+224, pls. 28).—A presentation of arguments in favor of the growing of scented flowers.

The rock garden (*Michigan Sta. Spec. Bul.* 228 (1933), pp. 84, figs. 70).—This bulletin is comprised of a discussion of the design and construction of rock gardens by C. P. Halligan and a discussion of the cultural requirements and characteristics of rock garden plants by C. E. Wildon.

Rock garden plants, C. E. WILDON (*Michigan Sta. Spec. Bul.* 228 Sup. (1933), pp. 41).—In tabulated form there are presented descriptive lists of hardy herbaceous rock plants, and of annuals, bulbs, and dwarf shrubs suitable for planting in a rock garden.

FORESTRY

[Forestry at the Connecticut State Station] (*Connecticut State Sta. Bul.* 347 (1933), pp. 277, 278).—In this brief report there is discussed the relation of soil characters to the growth of trees; the composition of forest litter; the value of certain species when treated with creosote as fence post material; the distribution of forest planting stock; and the control of blister rust by eradication of currants and gooseberries.

[Forestry at the Georgia Station] (*Georgia Sta. Rpt.* 1932, pp. 49–51).—A brief report is presented of studies upon seed harvesting, storing, and germination; seed bed management; soil adaptation; and spacing and cultural requirements of various forest tree species.

Ohio Forest News, [March 1933] (*Ohio Forest News* [Ohio Sta.], No. 21 (1933), pp. 8, figs. 3).—In addition to miscellaneous information on forests and forest activities, a list is presented of maples, buckeyes, ashes, and walnuts in the Wooster Arboretum.

Improving seedbed conditions in a Norway pine forest, H. L. SHIRLEY (*Jour. Forestry*, 31 (1933), No. 3, pp. 322–328, figs. 3).—Noting in stands of virgin Norway pine on the Chippewa National Forest, Minn., that due to the dense mat of needles and surface vegetation young pine seedlings could not establish themselves despite an ample supply of seed, certain areas in a 200- to 280-year-old stand of Norway pine were disked in early September 1930. Three practices were followed: (1) 5-ft. strips of disked soil with 10-ft. intervening untouched strips, (2) the entire area disked once, and (3) the entire area disked twice in opposite directions. Observations in 1931 showed Norway pine seedlings germinating wherever the mineral soil was exposed. Seedlings were especially numerous in the bottom of disked furrows where the seed apparently was protected to some degree from birds and rodents. At the end of the second growing season there was an average of 10,620 seedlings per acre on the disked area as compared with 860 on the undisked. The single complete diskings resulted in the establishment of more pine seedlings than did diskings in strips or diskings twice in opposite directions. Supplementary seeding was found of slight value on untreated areas and of doubtful value on cultivated areas where diskings was carried out in the presence of a good seed crop.

Sustained yield of Adirondack spruce and fir, A. B. RECKNAGEL (*Jour. Forestry*, 31 (1933), No. 3, pp. 343, 344).—A study of spruce and balsam fir growth suggested the possibility of continuous production of pulpwood if spruce were cut to a lower limit of 10 in. in diameter at breast height and fir to 6 in. Under the proposed system the cut 25 years hence would be practically the same as that secured at the present time.

Aspen competition in Norway pine plantations, F. H. EYRE (*Jour. Forestry*, 31 (1933), No. 3, pp. 318–321).—A study by the U.S.D.A. Lake States Forest Experiment Station of three adjacent plantations of Norway and white pines established in 1915 and 1917 on the Superior National Forest showed a striking aggressiveness of aspen. An examination of the areas in the two or three years following planting showed satisfactory establishment, but by 1931 large patches of aspen containing only a few stunted pines were noted. The number of planted pines was observed to be annually decreasing and the rate of height growth lessening, except where Norway pine was maintaining itself.

Release cuttings removing approximately 90 percent of the basal area of the aspen required an average of 6.25 man hours per acre.

A merchantable height table for beech in the Northeastern States, H. C. HEBB (*Jour. Forestry*, 31 (1933), No. 3, p. 343).—From data collected in the White Mountain National Forest, N.H., a table is presented showing the merchantable height and volume of beech. A tendency for height to decrease above 26 in. in diameter at breast height is ascribed to the defectiveness of the tops of older trees.

American cypress and its uses (U.S. Dept. Com., Bur. Foreign and Dom. Com., Trade Prom. Ser. 141 (1932), pp. IV+28, figs. 18).—This pamphlet, prepared jointly by the U.S. Department of Commerce Lumber Division and the National Committee on Wood Utilization, presents general practical information on properties and uses of American cypress as lumber.

The Sutlej deodar: Its ecology and timber production, R. M. GORRIE (*Indian Forest Rec.*, 17 (1933), No. 4, pp. [2]+140, pls. 10).—Tracing the plant associates of the deodar cedar growing under the moist monsoon conditions of the outer hills and in the arid regions behind the main ranges of the Himalaya Mountains, there was recorded a complete change of flora, except for blue pine (*Pinus excelsa*), which accompanied the deodar cedar everywhere, even up to the snow beds of the inner ranges. The capacity of deodar cedar to produce timber varied markedly with climatic changes, and for practical purposes the deodar itself was the best indicator of quality class. The ground flora found to indicate optimum conditions for deodar cedar in its moist and arid zones are given in tabular form.

A fast growing Douglas fir, T. J. STARKER (*Jour. Forestry*, 31 (1933), No. 3, p. 346).—Records taken on a Douglas fir tree stump located on the Oregon State College campus showed the tree to have been 65 years old at cutting and 28 in. in diameter at 3 ft. height. Certain of the annual rings were $\frac{7}{8}$ in. in width and were composed of from one half to two thirds summer wood.

Comparative radial growth of various oaks, A. C. MCINTYRE (*Jour. Forestry*, 31 (1933), No. 3, pp. 341, 342).—In this contribution from the Pennsylvania Experiment Station there are presented data on the comparative diameter growth of five oaks, namely, black, red, scarlet, white, and chestnut. Based on the width of the last 10 annual rings, black oak led in growth rate, followed in order by red, scarlet, white, and chestnut. On lower quality sites red oak grew more rapidly than black oak until reaching a diameter at breast height of 10 in., when the black oak surpassed it. White and chestnut oaks ranked the same on both good and poor quality sites. The author points out that the red, black, and scarlet oaks belonging to the black oak group surpassed the white and chestnut oaks belonging to the white oak group.

Weight of fruit of Nuttall's oak, R. K. WINTERS (*Jour. Forestry*, 31 (1933), No. 3, p. 340).—Weights taken by the U.S.D.A. Southern Forest Experiment Station in the fall of 1931 and 1932 on fruits and nuts of *Quercus nuttallii* collected in northern Louisiana and Mississippi showed 100 acorns to average 437.69 g. One lb. of acorns minus the cups and 1 lb. of acorn cups contained 103.6 and 516.5 units, respectively.

Specific gravity and related properties of softwood lumber, E. C. PECK (U.S. Dept. Agr., Tech. Bul. 343 (1933), pp. 24, figs. 9).—Stating that lumber is frequently compared in terms of weight, the author presents specific gravity data based on tests of sections of boards collected at sawmills throughout the United States for 14 commercially important softwoods. Arranged in descending order of average specific gravity of the heartwood were longleaf pine, shortleaf pine, western larch, Douglas fir, western hemlock, Norway pine, southern cypress, ponderosa pine, western white pine, Sitka spruce, redwood, northern

white pine, white fir, and sugar pine. The order with respect to sapwood was not exactly similar but was in much the same order. Longleaf pine, southern cypress, redwood, shortleaf pine, Douglas fir, ponderosa pine, and western larch displayed a broad range in specific gravity. In Longleaf pine, shortleaf pine, western larch, Douglas fir, and Norway pine there was noted a sharp contrast between the specific gravity of the spring wood and the summer wood. Ponderosa pine also showed a pronounced contrast, but the width of the summer wood varied markedly. In western white, northern white, and sugar pines there was only a slight contrast between spring and summer woods. In conclusion the author points out the importance of knowing not only the average specific gravity but the range in specific gravity of a species as an index to usefulness or suitability of the lumber for definite purposes. It is also deemed important to consider the contrast between summer and spring woods.

Causes of brashness in wood, A. KOEHLER (*U.S. Dept. Agr., Tech. Bul. 342 (1933), pp. 40, figs. 22*).—Brashness of the wood of any given species may result from adverse conditions during growth, or after-cutting factors, such as decay, severe bending or end compression, and subjection to prolonged high temperatures. Wood low in density for its species was found almost invariably brash, especially when dry.

Studies of the cellular structure of low-density wood showed a smaller amount of wood substance and a greater slope with respect to the cell axes of the fibrils in the walls of the cells in the predominating tissues. Species of normally low density were not characteristically brash but were found relatively weak.

In some oak the wood fibers were comparatively few in number, being replaced by other tissues which did not contribute so much to strength but were often just as heavy. Another weak type, namely, compression wood, formed on the lower side of leaning softwood trees, was found wide ringed, with a relatively large percentage of summer wood. Compression wood is brittle, and when dry ranks low in toughness and certain other strength properties. Wood subjected to either severe bending or end compression was observed to develop failures in the fiber walls, which may cause early failure under stress and abrupt fractures on the compression side.

With respect to the effect of prolonged high temperature, the indications were that abrupt fractures are not produced unless a temperature high enough to darken the wood is employed. In decayed wood shock resistance may be decreased even before the decay has advanced far enough to be easily recognized; hence the author suggests that no wood showing the least decay should be used where a high degree of toughness is required.

DISEASES OF PLANTS

Fungous diseases of plants, J. ERICKSSON, trans. by W. GOODWIN (*London: Baillière, Tindall & Cox, 1930, 2 ed., pp. VII+526, figs. 399*).—"This volume presents a general review of the more important fungus diseases which occur in northern and mid-Europe on field and garden crops and on certain trees of economic or ornamental value. Alongside the description of the various diseases are given the methods to be adopted for their prevention and control. Some of the diseases described are, so far, only known in other countries, but . . . may at any time make their appearance in northern and mid-Europe. Some new material which was not available at the time of the publication of the German edition, 1927-28 [E.S.R., 60, pp. 828, 829], is included in this edition, more particularly in the chapter on cereal and grass

rusts and in connection with certain diseases on peach, chestnut, and elm trees. . . . References to some of the chief publications follow the descriptions of the chief groups of fungi and forms of disease."

Mosaic disease of *Brunella vulgaris* [trans. title] J. I. LIRO (*Ann. Soc. Zool. Bot. Fennicae Vanamo*, 11 (1930), pp. 143-149, fig. 1).—It is claimed to have been found that different species of leaf lice are able to spread a mosaic attacking *B. vulgaris* under natural conditions.

Studies on tracheomycoses, R. VAN DER VEEN (*Onderzoekingen over Tracheomycosen. Proefschr., Rijks-Univ., Utrecht*, 1930, pp [6]+89, figs. 23).—This deals systematically in its several main sections with symptoms of tracheomycoses and a description of the causal agents (*Fusarium* sp. and *Verticillium* sp.), nutritional physiology of the fungus in pure culture, influence of nitrogen manuring on infection, the role of toxins in relation to the wilting, and the possibility of immunization.

The use of formaldehyde dust in growing seedlings, J. D. WILSON and P. E. TILFORD (*Ohio Sta. Bul.* 520 (1933), pp. 40, figs. 5).—Stating that there are two major methods of soil sterilization, (1) the use of high temperatures, and (2) of lethally toxic chemicals, the authors herein discuss the results of a number of experiments upon the influence of certain soil and other factors on the toxic effects of formaldehyde on various fungi and on vegetable and flower seeds and seedlings.

The mass treatment of soil at the rate of 8 oz. of a 6 percent formaldehyde dust per bushel of soil with few exceptions improved the stand of seedlings of many flowers and vegetables. Campanula, petunia, lettuce, and turnip seeds were often injured, and larkspur, gaillardia, carrot, corn, endive, and parsnip were not usually benefitted. The authors advise that seeds of the susceptible group, old seed, and weak seed should not be planted until 24 hours after treatment of the soil. The optimum dosage for the control of damping-off was found to be from 8 to 12 oz. of a 6 percent dust per bushel of soil, varying somewhat with the type of soil.

Field experiments in which formaldehyde dust was applied in the row with the seed showed considerable difference in susceptibility of species to injury. For plants rather sensitive to formaldehyde a 4.5 percent dust applied at the rate of 1 oz. per 30 ft. of row is recommended. Watering thoroughly directly after planting largely eliminated formaldehyde injury to the seed. In general the toxicity of formaldehyde decreased as the organic content and fineness of the soil increased. Drenching with a formaldehyde solution proved more harmful than dust in the rows. Mass treatment proved too costly for field use.

When seedlings were being transplanted a delay period of 72 hours was necessary following treatment to avoid injury. However, formaldehyde escaped more readily from warm, dry soil than from cold, wet soil. Here again the fineness of the soil and the increased organic content decreased injury. Finely divided carriers, such as charcoal dust and infusorial earth, permitted a more rapid escape of formaldehyde than did kaolin or muck, and hence tended to reduce injury. The use of 6 percent formaldehyde dust at the rate of 8 oz. per bushel of soil killed *Pythium debaryanum*, *Sclerotium delphinii*, *Fusarium lycopersici*, and the mycelium but not the sclerotia of *Rhizoctonia solani*. The nematode population of screened soil was reduced materially by formaldehyde dust treatment.

Carbon disulfide emulsion for the control of the root-knot nematode, E. F. GUBA (*Massachusetts Sta. Bul.* 292 (1932), pp. 16, figs. 3).—Stating that root knot caused by the nematode *Heterodera radiculicola* is the most prevalent and destructive disease of greenhouse cucumbers and tomatoes in Massachusetts and the most costly to control, the author reports that in greenhouse experiments

with tomatoes carbon disulfide emulsion proved to be an effective nemacide and if used properly may be relied upon to eliminate nematodes as a serious factor in crop losses. A stock solution containing 68 percent carbon disulfide, 26 percent water, and 6 percent rosin fish oil soap was diluted in water to make a 1:50 concentration and applied at the rate of 1 gal. per square foot of soil. Where soil pathogenes are present the addition of formaldehyde is recommended.

Sanitation, which includes the removal of infested roots when the houses are cleaned out, decay of root material remaining, and thoroughness of application, contributed much to the effectiveness of the carbon disulfide treatment. Allowing the beds to lie idle for 2 or 3 weeks after the old crop was removed assisted materially in the decay of the old roots. A delay of one week after the carbon disulfide treatment was found necessary before planting. The exposure to carbon disulfide for more than 5 hours at one time may cause illness to the workman.

[Control of plant diseases in Connecticut] (*Connecticut State Sta. Bul.* 347 (1933), pp. 274, 275).—Brief notes on the value of a spray of lime, lead arsenate, and fish oil for sooty blotch and apple scab, the value of calcium cyanamide for controlling clubroot of cabbage and cauliflower, and spraying potatoes with 8-8-50 Bordeaux mixture are given.

[Plant disease studies by the Florida Station] (*Florida Sta. Rpt.* 1932, pp. 58, 59, 128-148, 151, 152, 199-202, 207, 208, fig. 1).—Data are given from studies of die-back of citrus, by B. R. Fudge (pp. 58, 59); the gumming of citrus, by A. S. Rhoads (p. 129); melanose and stem-end rot of citrus, by G. D. Ruehle and W. A. Kuntz (pp. 129, 130); citrus canker, by K. W. Loucks (pp. 130, 131); citrus scab and its control, by Ruehle (pp. 131, 132); nail head spot of tomatoes, by G. F. Weber (p. 132); a decay of strawberry roots caused by *Sclerotium rolfsii*, by A. N. Brooks and R. E. Nolen (pp. 132, 133); late blight, scab, rhizoctonosis, brown rot, and other potato diseases, by A. H. Eddins (pp. 133, 134); diseases of corn caused by *Physoderma zeae maydis*, *Diplodia* spp., and *Fusarium* spp., by R. K. Voorhees (pp. 134-137); control of diseases of Easter lily, gladiolus, and narcissus bulbs, by W. B. Shippy (pp. 137, 138); resistance to *Fusarium* wilt and mosaic of watermelons, by M. N. Walker (pp. 138-141); the so-called "rust" of *Asparagus plumosus*, by Shippy (p. 141); control of tomato wilt, by Weber and D. G. A. Kelbert (p. 142); *Clitocybe* mushroom root rot of citrus and other woody plants, by Rhoads (pp. 142, 143); control of black spot (*Phoma destructiva*) of tomatoes, by W. B. Tisdale and S. Hawkins (pp. 143, 144); strawberry wilt or crown rot, by Brooks (pp. 144, 145); stem-end rot of citrus caused by *Phomopsis citri*, by Kuntz (pp. 145, 146); decays of citrus fruits in storage, by Tisdale and E. West (pp. 146, 147); spraying requirements for control of grape diseases, by Loucks (pp. 147, 148); downy mildew or blue mold of tobacco, by L. O. Gratz (pp. 151, 152); the powdery mildew and the so-called yellowing disease of beans, early blight and bacterial spot of celery, early and late blight of potatoes, leaf blight of carrots, virus diseases of potatoes, and *Phytophthora* blight of peppers, by H. H. Wedgworth (pp. 199-202); and varietal resistance to sugarcane mosaic and control of damping-off of sugarcane seedlings, by B. A. Bourne (pp. 207, 208).

[Plant disease studies by the Georgia Station] (*Georgia Sta. Rpt.* 1932, pp. 34-36).—Data are reported on studies of tomato wilt, pepper fruit rots, peanut leaf spot, the advantages of planting shelled peanuts, breeding peanuts for disease resistance, winter injury to peaches, downy mildew of cantaloups, and the control of tomato diseases in the seed bed.

[Plant disease studies in Kansas] (*Kansas Sta. Bien. Rpt.* 1931-32, pp. 85-88, 89, 123, 124).—Data are reported as to oat smut; wheat bunt, flag smut,

and foot rot; *Helminthosporium* foot rot; resistance to corn diseases and seed treatment for their control; the finding of 5 physiologic forms of *Sphacelotheca sorghi* and 2 forms of *S. cruenta*; a new disease of milo; *Rhizoctonia solani* and the relative efficiency of various fungicides for its control; sweetpotato stem rot control; resistance of winter wheat to leaf rust; and bacterial wilt of alfalfa.

[Plant disease studies in Minnesota] (*Minnesota Sta. Rpt. 1932*, pp. 13, 14, 15, 16, 17, 24, 25, 33).—Data are reported on the finding of a bacterium antibiotic to *Ustilago zeae*, by R. H. Bamberg (pp. 13, 14); the antibiosis of certain bacteria to smuts and some other fungi, by D. E. Johnson (pp. 14, 15); hybridization and segregation in the oat smuts, by C. S. Holton (pp. 16, 17); the genetics of *U. zeae*, by J. J. Christensen (pp. 24, 25); and diseases of peonies, by L. Dosdall (p. 33).

[Plant disease studies in New Mexico] (*New Mexico Sta. Rpt. 1932*, pp. 38, 42, 43, 46, 47, 68, fig. 1).—Data are reported on wilt of chili peppers, apple measles, chlorosis, root rot, and tomato diseases.

[Reports of the Dominion botanist for the years 1928, 1929, and 1930], H. T. GÜSSOW ET AL. (*Canada Expt. Farms, Div. Bot. Rpts. 1928*, pp. 242, figs. 51; 1929, pp. 234, figs. 67; 1930, pp. 185, figs. 32).—These reports preserve the general form outlined in the report for 1927 (E.S.R., 64, p. 144), adding data regarding plant disease studies for the respective years.

Control methods for diseases of cereal, forage, and fibre crops, H. T. GÜSSOW (*Canada Dept. Agr. Pam. 123, n. ser. (1930)*, pp. 15).—This pamphlet is intended to summarize the present knowledge regarding plant disease control methods comprising exclusion, eradication, seed selection, seed treatment, dusting and spraying, cultural methods, sanitation, and use of disease-resistant varieties so far as applicable to wheat, oats, barley, rye, corn, millet, flax, sunflower, alfalfa, sweetclover, and common clover.

Report from the mycological department, E. S. SALMON and W. M. WARE (*Jour. Southeast. Agr. Col., Wye, Kent, No. 27 (1930)*, pp. 87–96).—This report includes investigations relating to apple scab, and to hop powdery mildew, downy mildew, nettle head, chlorotic disease, and mosaic.

II. The inheritance of resistance to *Puccinia graminis tritici* in crosses between varieties of *Triticum vulgare*, K. W. NEATBY and C. H. GOULDEN (*Sci. Agr.*, 10 (1930), No. 6, pp. 389–404, figs. 5).—In a continuation of the account previously noted (E.S.R., 66, p. 440), data are presented on the inheritance of resistance to stem rust in the field, 11 different crosses being included in the study.

The relation between stem rust infection and the yield of wheat, C. H. GOULDEN and F. J. GREANEY (*Sci. Agr.*, 10 (1930), No. 6, pp. 405–410, figs. 3).—After experiments controlling the amounts of rust in Marquis wheat by varying the intervals and rates of applications using sulfur dust, the resulting yields were correlated with the rust percentages. The results from two such experiments are summarized in the form of correlation coefficients and regression equations.

In one experiment each 10 percent of rust reduced yield approximately 6.8 percent. In the other, 10 percent rust reduced yield 9.7 percent. In both experiments the regression of yield on percentage of rust was linear, indicating that uniform increases in rust result in uniform reductions in yield.

Field studies of take-all in Saskatchewan, R. C. RUSSELL (*Sci. Agr.*, 10 (1930), No. 10, pp. 654–668, figs. 6).—Wheat take-all (*Ophiobolus graminis*) is said to have been first reported as in Canada from Saskatchewan in 1923, and to be now distributed in certain districts to an injurious but fluctuating

extent. A method is given of distinguishing this from other wheat rots which are present in Saskatchewan. Systematic field surveys from 1924 to 1929 have indicated that simple crop rotations satisfactorily control the disease.

Etiology of the bacterial diseases of beans in Bulgaria [trans. title], I. KHR. KOVACHEVSKI (I. KOVACHEVSKY) (*God. Sofisk. Univ., Agron. Fakult. (Ann. Univ. Sofia, Facult. Agron.)*, 7 (1928-29), pp. 429-444; *Eng. abs.*, p 444).—The common field bean, so widely grown in Bulgaria as to constitute one of the important crops, has become unprofitable despite favorable soil and climatic conditions, on account of severe annual losses due to the bacterial diseases blight and wilt caused by *Phytomonas phaseoli* and *P. flaccumfaciens*, both widely distributed. No native bean is immune to either disease organism. "Only the pea bean (oblets) show a relative resistance to *P. phaseoli*." Both organisms resist dry heat. The infection persists in seed dried at 52° C. for 20 hours, afterwards kept at 75° for 20 hours, and then at 85° for from 3 to 5 hours. This treatment materially impairs germinability.

Some diseases of cabbage and other crucifers in Florida, G. F. WEBER (*Florida Sta. Bul.* 256 (1932), pp. 62, figs. 47).—Various diseases which cause important losses in Florida to economic members of the crucifer family are described, particularly with reference to the plant most often and most severely attacked. Methods of control are outlined wherever such is possible. In addition there is presented a list of crucifer diseases not found in Florida and of certain physiological troubles found occasionally. Methods of seed treatment are discussed in detail.

Infection of corn plants by *Physoderma zeae-maydis* Shaw, A. H. EDDINS (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 3, pp. 241-253, figs. 4).—All the subspecies of *Zea mays* proved susceptible to brown spot caused by *P. zeae-maydis* (E.S.R., 40, p. 846) when artificially inoculated in experiments at the Florida Experiment Station, whereas a number of other grasses failed to show infection. Brown spot was most often located on the leaf blades and sheaths of corn plants at or below the fourth node from the ground. This disease was produced most effectively in the greenhouse by injecting a water suspension of sporangia into the stalks of plants 2 to 3 ft. high at or near their growing points, and in the field by filling the upper whorl of leaves with inoculum from a hand pressure sprayer when the plants were 45 to 52 days old and 35 to 51 in. high. The reaction of inbred lines to brown spot in the greenhouse was not a true indication of their reaction under field conditions.

Infection was produced by sporangia kept in soil in test tubes buried 1 ft. deep in the ground for 3 years, kept in a bottle in the laboratory for 3 years, remaining in leaf sheaths exposed to weather for 2 years, and by sporangia taken from diseased areas in green leaf sheaths. Eleven days from inoculation was the minimum time required for sporangia to develop in greenhouse plants, and 16 days in the field. Brown spot developed more in the wet season of 1930 than in the dry season of 1931. Varieties and inbred lines of corn were found to differ in susceptibility to brown spot.

The downy mildew of the hop in British Columbia, W. NEWTON and C. YARWOOD (*Sci. Agr.*, 10 (1930), No. 8, pp. 508-512).—Hop downy mildew (*Pseudoperonospora humuli*), first observed in British Columbia in the spring of 1928, became in that year epidemic in all the commercial hopyards of Sardis, Sumas, and Agassiz, and on the escaped hops at long distances. Losses due to infection of bines and cones ran as high as 50 percent. The disease is discussed as regards symptoms, mode of infection, artificial infection experiments, and resistance of species and varieties.

Young leaves proved more susceptible than old. Uninjured leaves were infected through the lower surface, injuring leaves through either. The common nettle of British Columbia, *Urtica lyallii*, is immune. All commercial hop varieties except Fuggles were susceptible.

It appeared advantageous to add potassium resin soap to the Bordeaux spray used, and to employ dust only when it could be directed against damp foliage with considerable force.

Studies on the downy mildew of onions and the causal organism, *Peronospora destructor* (Berk.) Caspary, H. T. Cook (*New York Cornell Sta. Mem.* 143 (1932), pp. 40, figs. 11).—Asserted to be one of the most serious diseases of the onion, downy mildew was found to attack with equal virulence all of 53 varieties of common onion included in the tests. *Allium schoenoprasum* (chives) was added to the seven species previously recorded as susceptible. Onion plants were observed to be attacked at any stage in their existence, and measurements showed that bulbs are considerably stunted by the disease, which is favored by abundant moisture and relatively low temperature. Onions became diseased as early and as frequently on fresh as on old soil. The first diseased plants were found scattered throughout the fields.

Of the four sources of primary inoculum, namely, systemically infected plants, infested soil, infested seed, and infected seed, evidence indicated that mycelium in the seed is an important agent. With respect to temperature, the fungus was found to fruit over a wide range. Water on the leaves was found essential to the formation of conidiophores and conidia. Of various media, lake water was most satisfactory for spore germination, which occurred from 3° to 27° C. with an optimum at 11° (51.8° F.). The incubation period was about 11 to 15 days.

The field application of fungicides was found unpractical and of dubious value. The necessity of continuous treatment from seedling stage to maturity rendered protection of prohibitive cost. The more practical means of control is believed to lie in the exclusion of the fungus, that is, the use of disease-free seed and sets and avoiding the introduction of soil from infested fields on tools or on transplants. The destruction of onion refuse and the rotation of crops are also deemed advisable.

Prevention of blight in seed potatoes, T. SMALL (*Nature [London]*, 130 (1932), No. 3279, p. 367).—It is stated that in Jersey, Channel Islands, where seed potatoes are usually dug while the haulms are still green, the presence of *Phytophthora infestans* on the foliage may occasion serious losses owing to the fall of spores on the tubers when so exposed. Losses of from 50 to 75 percent are not uncommon, but experimentation carried out at the States Experimental Station, Glenham, is said to have shown that such loss may be almost entirely annulled by twice dipping the seed tubers soon after digging in 1 percent formalin, or in a mixture of copper sulfate and caustic soda solution (4 : 1.25 : 40), which does not impair sprouting.

Potato canker and its control [trans. title], T. J. HINTIKKA (*Maataloustiet. Aikakausk. [Helsinki]*, 1 (1929), No. 1-2, pp. 49-59; *Ger. abs.*, p. 59).—The results obtained in this work led to the conclusion that soil disinfection measures employing poisons to destroy the resting spores of *Synchytrium endobioticum* causing potato canker cannot be relied upon to be effective, but that resort must be had to the aid of physical measures. International action is considered justifiable and necessary in view of the extension of the pest to many countries.

Psyllid yellows of the potato, B. L. RICHARDS and H. L. BLOOD (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 3, pp. 189-216, figs. 7).—The symptoms of psyllid

yellows (E.S.R., 65, p. 238) under ordinary summer light intensity, as studied at the Utah Experiment Station in cooperation with the U.S. Department of Agriculture, include yellowing, basal leaf rolling, and purpling of the younger leaves; yellowing and rolling of older leaves; nodal enlargement; increased leaf axillary angle; aerial tuberization and shoot proliferation; apical rosetting; excessive underground tuberization; and inhibition of the rest period. Under reduced light intensity, basal, marginal, and interveinal yellowing of the leaflets is pronounced. The purpling and leaf rolling are greatly reduced.

The disease was found to be caused by the feeding of nymphs of the tomato psyllid (*Paratrioza cockerelli* Sulc.) (E.S.R., 66, p. 555). Feeding adult psyllids failed to induce the disease in numbers up to 1,000 per plant, whereas as few as three to five nymphs frequently induced the disease, although uniformity of symptom expression required approximately 15-30 insects. Continuous feeding of the insects appears to be necessary to full expression of the disease. Recovery following the removal of the insects was observed in the greenhouse and in the field except where the disease development progressed to the point of initiating degeneracy. *P. cockerelli* appears to be the only insect capable of inducing the disease in the potato and related plants. Attempts to transmit psyllid yellows artificially failed. Under Utah conditions the disease does not appear to be transmitted from one generation to another through the tuber.

In preliminary tests, nymphs of *P. cockerelli* were not separated from the infective principle by hatching eggs on healthy potato leaves in petri dishes. The exact nature of the disease-inducing principle remained unknown. The virus theory of the etiology of the disease seemed questionable, and the possible existence of a toxic substance injected into the plant during feeding of the nymphs is suggested. The small size, ease of dissemination, prolific fecundity, apparent wide-spread distribution, and wide host range including common perennial *Solanums* are deemed vital factors in the epidemiology of the disease.

Important diseases of rice crop in Japan, S. L. KUWANA (*Proc. 4. Pacific Sci. Cong., Java, 1929, vol. 4, pp. 203-207*).—Rice disease organisms listed with indication as to forms, favoring conditions (including carriers), susceptibility, and prevention or treatment include *Piricularia oryzae*, *Helminthosporium oryzae*, *Pseudomonas oryzae*, *Hypochnus sasakii*, and *Sclerotium oryzae*. A rice virus disease called "ine no ishiku byo" occurs in the nursery beds and fields while the rice is young.

The "mentek" disease of rice, P. VAN DER ELST (*Proc. 4. Pacific Sci. Cong., Java, 1929, vol. 4, pp. 329-331*).—This disease, considered to be by far the most important of irrigated rice in Java, and supposed to be identical with imoci in Japan, ufra in India, brusone in Italy, and rust in the United States, is said to be nonparasitic, though it may be combined with attacks by fungi or pests. It is supposed to be a physiological trouble due to more or less abrupt shortage of available nutritive factors in the soil or inability of the root system to absorb properly, or to both of these causes.

Notes on gumming disease of sugar cane, J. L. ILLINGWORTH ([*Bridgetown*], Barbados: [Govt.], 1930, pp. [2]+12).—This report of special observations on gumming disease in the Leeward Islands, particularly Antigua, includes an account of work done jointly by F. H. S. Warneford and the author, and partly by Illingworth alone. It is said to cover the progress up to October, 1929, and in addition to present a general account of the disease.

Observations regarding the gumming disease in the cane Ba. 11569 as regards the 1929 crop suggest that the marked incidence might be due to the conditions resulting from the hurricane of September 12, 1928, considered as very favorable to the gumming causal organism, *Bacterium vascularum*. Observations on

young ratoon canes indicate that, while leaf symptoms are becoming general in well grown fields, stem gumming has by no means reached its maximum. The diminution of infection in second ratoons seems an important point still to be investigated.

Changes induced in cells of sugar cane by mosaic, J. DUFRENOY (*Proc. 4. Pacific Sci. Cong., Java, 1929, vol. 4, pp. 25-27, figs. 2*).—The mosaic-induced changes in sugarcane cells here briefly described extend to the mitochondria, which are said to be easily demonstrated. Many differentiate into amyloplasts, developing starch grains.

Effects of formaldehyde on *Ceratostomella fimbriata* and the sweet-potato, R. F. POOLE (*Jour. Agr. Res. [U.S.], 46 (1933), No. 3, pp. 281-290, figs. 4*).—According to a study of the effects of different strengths of formaldehyde used for various periods in treating the black-rot fungus (*C. fimbriata*) and the sweetpotato, made at the North Carolina Experiment Station, formaldehyde is neither practical nor satisfactory as a disinfectant for sweetpotatoes, and there appears to be no safe strength and length of formaldehyde treatment for the crop. Spores of *C. fimbriata* were controlled in formaldehyde containing 40 percent gas after 14 minutes in a strength of 1-25, 40 minutes in 1-50, 70 minutes in 1-75, 100 minutes in 1-100, 4 hours in 1-150, 6 hours in 1-200, and 9 hours in 1-250 strengths. However, the sweetpotato was injured severely by formaldehyde in 1-25, 1-50, 1-75, 1-100, and 1-150 strengths even at short exposures that did not kill the spores. Treatments for 4 hours in 1-200, 1-250, and 1-300 dilutions did not control the fungus, and caused a definite breaking down of the sweetpotato and greater susceptibility to decay from other fungi. Sweetpotatoes injured by both chemical and water were very susceptible to *Trichoderma*, *Rhizopus*, *Penicillium*, *Fusarium*, and other organisms.

Pathology of tobacco [trans. title], E. FOËX (*Mém. Manfr. État, Tabacs—Allumettes, 6 (1930), No. 2, pp. 275-297*).—The conditions affecting the value of tobacco are herein limited to those coming under the heads teratology, traumatism, and disorders here classed as physiological.

Tomato leaf mould, T. SMALL (*Expt. and Res. Sta., Cheshunt, Herts, Ann. Rpt., 16 (1930), pp. 40-56, figs. 8*).—In experimentation to control tomato leaf mold (*Cladosporium fulvum*) with fungicides and fumigants, most of the sprays gave better advantage with Agral 1 than when saponin was used as a spreader. Effective control on pot plants was obtained with ammonium copper carbonate, colloidal sulfur A, and salicylanilide. Ammonium copper carbonate was also useful to spray diseased crops. Control in laboratory experiments was secured by use of the fumigants ethylene dibromide, quinone, and thymol, and in a small glasshouse by quinone. Sulfur fumigation protected only the upper leaf surface, though infection occurred on either side.

Large, empty glasshouses may be practically freed from infection by use of formaldehyde or sulfur dioxide. The relation is shown of leaf mold to environmental conditions in case of commercial nurseries.

The minimum, optimum, and maximum temperatures for spore germination are respectively below 38° F., from 72° to 77°, and 89°. The germ tubes can withstand considerable dry periods. The thermal death point of the spores is 115°. Spores on diseased leaves are not killed by exposure to high temperatures on several successive days.

Mosaic disease of the tomato, W. F. BEWLEY and W. CORBETT (*Expt. and Res. Sta., Cheshunt, Herts, Ann. Rpt., 16 (1930), pp. 56-62*).—Of the two main types of mosaic herein recognized, so-called ordinary mosaic is described as typified by the mildness of its symptoms; so-called aucuba or yellow mosaic by its intense yellow color, the yellow, orange, or silver blotches on the fruits, and the frequent severe crippling of the plants.

Experiments since 1924 have shown that when aucuba mosaic of tomato is transmitted to tobacco by inoculation with the crushed tissue or filtered virus, a violent and progressive necrosis results. When juice of this tobacco necrotic tissue is inoculated back into tomato, aucuba symptoms develop, an occasional plant showing symptoms typical of stripe disease. Inoculation experiments are described in some detail.

Physiological investigations of mosaic disease in the tomato, B. D. BOLAS (*Expt. and Res. Sta., Cheshunt, Herts, Ann. Rpt., 16 (1930), pp. 62-67*).—This is a progress report, in which the results are “to be regarded as indicating the relative importance of certain lines of work and not as completed researches.”

The control of apple scab, I, II (*Jour. Southeast. Agr. Col., Wye, Kent, No. 27 (1930), pp. 186-194, figs. 4; 195-201, fig. 1*).—Two separate two-variety tests are recorded.

I. Bramley's Seedling and Newton Wonder, N. B. Bagenal, W. Goodwin, E. S. Salmon, and W. M. Ware.—Bramley Seedling gave in 1924 53 per cent of scab-free apples when sprayed with Bordeaux mixture three times, and with two sprayings 37 and 27 percent; with lime-sulfur three times, 32 and 25 percent, and twice, no crop; lime-sulfur plus lead arsenate three times, 52 per cent; and with the control 4 percent of scab-free apples. In 1925 Bramley Seedling when sprayed with Bordeaux mixture three times, gave 64 and 54 percent of scab-free apples, and twice 53 and 49 percent; with lime-sulfur three times, 61 and 51 percent, and twice, 60 and 39 percent; with lime-sulfur plus lead arsenate three times, 57 and 49 percent, and twice, 52 and 48 percent. The controls gave 38 and 30 percent of scab-free apples.

Newton Wonder in 1925 sprayed with Bordeaux mixture three times gave 89 and 83 percent of scab-free apples, and twice, 75 and 74 percent; with lime-sulfur three times, 88 and 84 percent, and twice, 89 and 87 percent; lime-sulfur plus lead arsenate three times, 87 and 83 percent, and twice, 87 and 69 percent; and the control, 78 and 68 percent of scab-free apples.

With both varieties, except one plat in 1924, additions of lead arsenate did not increase fungicidal value. In both seasons lime-sulfur caused scorching, with occasional leaf fall, on Newton Wonder apples. On this variety also lime-sulfur plus lead arsenate caused scorching and sometimes severe leaf fall. No scorching appeared on Bramley Seedling due to lime-sulfur or lime-sulfur plus lead arsenate. On both varieties in 1925 lime-sulfur gave almost as good control of scab as did Bordeaux mixture.

II. Allington Pippin and Newton Wonder, W. Goodwin, E. S. Salmon, and W. M. Ware.—Allington Pippin trees sprayed with Bordeaux mixture three times gave 87 percent of scab-free apples; when sprayed at the pink-bud stage with Bordeaux mixture followed with lime-sulfur 1:60, 92 percent of scab-free apples; and the controls gave 20, 20, and 30 percent of scab-free apples.

Newton Wonder trees sprayed with Bordeaux mixture three times gave 74 percent of scab-free apples; spraying at the pink-bud stage with Bordeaux mixture with one postblossom application of lime-sulfur (under atypical conditions described) gave 49 percent. Control apple trees showed 32, 14, and 17 percent of clean apples.

Lime-sulfur 1:60 immediately after petal fall caused leaf fall on Newton Wonder, but caused no damage to Allington Pippin apples. Two postblossom applications of lime-sulfur following a preblossom application of Bordeaux mixture gave no better finish to Allington Pippin apples than did three applications of Bordeaux mixture, which caused no russetting of commercial importance to Allington Pippin or Newton Wonder.

Apple-rot fungi in the overseas transport and marketing of New Zealand apples, M. N. KIDD (*New Zeal. Jour. Sci. and Technol.*, 11 (1929), No. 1, pp. 30-32, fig. 1).—Experimentation during 1928, constituting what is considered a fairly representative test as regards varieties (Cox Orange Pippin, Jonathan, and Sturmer Pippin), localities, and shipping conditions, is described in connection with tabulations and graphical representations.

The greatest loss was caused in the case of Cox Orange Pippin by *Diaporthe perniciosa* and in the case of Jonathan and Sturmer Pippin by *Physalospora cydoniae*, though the difference may be attributed partly to locality. The spores of the causal fungi supposedly came originally from the orchard, where some trees are seriously damaged by fungi, particularly by the two above named, though also by others, as *Glomerella cingulata*. Particular interest attaches to the presence of certain fungi not hitherto recorded for New Zealand, as *D. perniciosa* and *Fusarium fructigenum*. Wound and stem-end infection predominate. A case of wastage in apples still green, due to stem-end infection with *Sphaeropsis malorum*, is reported.

A new plum disease [trans. title], M. BERGAMASCHI (*Atti Ist. Bot. R. Univ., Pavia*, 4 ser., 2 (1930), pp. 89-92, figs. 2; *Latin abs.*, p. 92).—This brief preliminary note describes a disease of *Prunus domestica*, said to be new and to be caused by the parasitic action of *Microstroma tonellianum*, which has been obtained from plum leaves.

The defoliation of gooseberries by sulphur-containing sprays, H. MARTIN (*Jour. Southeast. Agr. Col., Wye, Kent*, No. 27 (1930), pp. 182-185).—The abnormal leaf cast which occurs with certain gooseberry varieties a few days after the application of lime-sulfur to control American gooseberry mildew (*Sphaerotheca mors-uvae*) is herein dealt with, more particularly in case of the variety Leveller. This is said to suffer defoliation when sprayed with 1:60 lime-sulfur, 3 percent dry-mix sulfur-lime, or 0.4 percent Ialine colloidal sulfur (with 0.5 percent soft soap). The amount of leaf fall was not diminished by the addition to the lime-sulfur of aluminum sulfate.

These experiments did not confirm the view that the constituents of lime-sulfur causing defoliation are the soluble sulfides. The results suggest that elementary sulfur is the cause of the defoliation.

The present status of the question of the nematode diseases of coffee [trans. title], W. BALLY and G. A. REYDON (*Arch. Koffiecult. Nederland. Indië*, 5 (1931), No. 2, pp. 23-216, figs. 46; *Eng. abs.*, pp. 202-210).—This account comprises an introductory discussion of coffee nematode diseases, symptoms, methods of research, classification of the organisms according to their significance in this connection, host and parasite relations, occurrence (distribution) of the nematodes, preventive or remedial measures, and a list of relevant literature.

A table is given, indicating descriptively only the nematodes described in these chapters as regularly met with in the examination of coffee roots. This account includes, as parasitic and noxious, *Tylenchus coffeae* (*T. penetrans* ?) and *T. similis* (*T. acutocaudatus* and *T. biformis*); as parasitic but usually nonnoxious, *Caconema radicum* (*Heterodera radicum*) and *Paratylenchus besoekiana* n. sp.; as doubtful, *T. procerus* n. sp., *Tylenchorhynchus robustus* (*Tylenchus robustus* and *Tylenchorhynchus robustus brevicaudatus*), *T. robustus erythrinae* (*Tylenchus erythrinae* and *Tylenchorhynchus robustus pseudorobustus*), *Aphelenchus parietinus* (*A. coffeae*), and *Paraphelenchus maupasi* (*A. agricola*); as secondary, *Dorylaimus javanicus*, *D. zimmermanni* n. sp., *D. menzeli* n. sp., *Cephalobus persegnis brevicaudatus* (*C. brevicaudatus*), *C. longicaudatus*, *Rhabditis* sp. (*R. coffeae affinis* and *R. coffeae* ?), and

Diploscapter coronata (*R. coronata* and *R. bicornis*); and, as predacious against other nematodes, *Mononchus* sp. (*M. trichurus affinis*).

Studies on septorioses of plants, II—IV (*Mem. Col. Agr., Kyoto Imp. Univ., No. 13* (1931), pp. 1–40, pls. 5, figs. 10).—Three additional sections of the study previously noted (*E.S.R.*, 61, p. 654) appear below.

II. *Septoria azaleae* Voglino causing the brown-spot disease of the cultivated azaleas in Japan, T. Hemmi and S. Kurata (pp. 1–22).—The authors note the occurrence and seriousness of a disease of cultivated azaleas near Kyoto, determined by them as due to *S. azaleae*. This disease appears first in early autumn on the leaves, commonly in the form of brown spots spreading with the approach of cold weather (from December to March), often causing such loss of leaves as to result in extreme weakness to the plant. The spots differ from those described by Europeans as due to *S. azaleae*. The present authors have collected diseased leaves of *Rhododendron obtusum* showing brown patches said to be similar to those described in the European account. In the present paper the morphological as well as the cultural characters of the causal fungus are presented. The most favorable liquid or agar medium proved to be potato decoction or nutrient agar with peptone. Vigorous growth occurs from 16° to 28° C., the best in liquid media at 24°. Inoculation experiments proved the pathogenicity on agar medium.

III. *On Septoria callistephi* Gloyer pathogenic on the China aster, H. Nakamura (pp. 23–32).—*S. callistephi* is widely distributed and destructive in Japan as a leaf blight of the cultivated China-aster (*Callistephus chinensis*). Occasionally the leafstalk, calyx, and flower stalk are attacked. The fungus grows favorably both on agar and on liquid media, the favorable temperature for mycelial growth being from 20° to 28°. Inoculation of the host plant with spores produced on soy agar proved successful.

IV. *New or noteworthy species of Septoria found in Japan*, S. Hirayama (pp. 33–40).—The author contributes to this series the results of his investigations as regards hitherto unreported species, with descriptions of *S. abeliceae* n. sp., *S. aparines*, *S. asteromoea-savatierii* n. sp., *S. bupleuri*, *S. crepidis*, *S. ecliptae* n. sp., *S. erigerontis*, *S. glechomae* n. sp., *S. patriniae*, and *S. vilarsiae* on leaves, respectively, of *Abelicea hirta*, *Garium strigosum*, *Asteromoea savatieri*, *Bupleurum falcatum*, *Crepis japonica*, *Eclipta alba*, *Erigeron annuus*, *Glechoma hederacea*, *Patrinia villosa*, and *Limnanthemum nymphoides japonica*.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Second International Conference and Colonial Congress on the Rat and the Plague, 1931, edited by G. PETIT (*2. Conférence Internationale et Congrès Colonial du Rat et de la Peste, Paris, 1931. Paris: Vigot Bros., 1932, pp. 650, figs. [124]*).—The proceedings of the second conference (*E.S.R.*, 67, p. 420), held in Paris, October 7–12, 1931, here reported, deal with the biology of the rat, its parasites and relation to the transmission of the plague disease of man.

Making sulfonated linseed oil for rabbit and mouse repellent, R. B. HARVEY (*Minn. Hort.*, 59 (1931), No. 9, pp. 205, 215, figs. 2).—In tests made for the protection of apple and plum trees against rabbits, a mixture consisting of sulfur one part and linseed oil nine parts, which upon heating forms a sulfonated oil of a rubbery consistency, has been found to furnish effective protection. Tested on a block of 1,200 apple and plum trees in a locality infested with rabbits, it appeared to be a good repellent. Tested with rabbits confined in a wire enclosure and given nothing else to eat, the control trees were first attacked, followed by those treated with blood, then concentrated

lime-sulfur, the sulfonated oil protected trees being attacked last and then only limbs being nibbled.

Portraits of New England birds, L. A. FUERTES and A. BROOKS ([*Boston*]: *State*, 1932, pp. VI, pls. 93).—This is a collection of the colored plates previously referred to (E.S.R., 68, p. 635). Changes have been made in the common names of some of the birds illustrated to conform with the last edition of the Check-List of North American Birds (E.S.R., 66, p. 845).

Birds of the Battle River region, with notes on their present status, migration, food habits, and economic value, F. L. FARLEY (*Edmonton, Alta.*: *Inst. Appl. Art*, 1932, pp. 85, figs. 14).—Following an introduction (pp. 3–13), part 2 consists of notes on 238 birds occurring in central Alberta (pp. 14–59). Supplementary information in part 3 (pp. 60–82) gives tables showing the average date of arrival of spring birds in the vicinity of Camrose, Alta., from 1907 to 1931, last date on which birds were recorded there in the fall of 1931, and spring arrival dates during the past 40 years of three well-known summer-resident birds in central Alberta.

South China birds, H. R. and J. C. CALDWELL (*Shanghai*: *Hester May Vanderburgh*, 1931, pp. [14]+447, pls. 38).—This work is described as a complete, popular, and scientific account of nearly 550 forms of birds found in Fukien, Kwangtung, Kiangsi, Kiangsu, and Chekiang Provinces, China. It includes six colored plates from drawings by A. Allison.

The birds of Nippon, Vol. I, pt. 1, PRINCE TAKA-TSUKASA (*London*: *H. F. & G. Witherby*; *Tokyo*: *Yokendo*, 1932, vol. 1, pt. 1, pp. IV+70, pls. 10, figs. 3).—In this first part of a work on the birds occurring in the Japanese possessions, a brief introduction (pp. I–IV) is followed by an account of the galline birds.

Australian finches in bush and aviary, N. W. CAYLEY (*Sydney*: *Angus & Robertson*, 1932, pp. [XIX]+256, pls. [21], figs. 31).—This account of the finches in Australia includes chapters on Among the Finches in Their Natural Haunts in Northern Australia, by E. W. Jones (pp. 225–228); General Hints on Housing, by F. Buckle (pp. 229–237); Good Health, by L. J. Clendinnen (pp. 238–241); and Notes on the Commoner Ailments of Cage-Birds, by E. A. D'Ombraïn (pp. 242–250). The work is illustrated by 10 colored plates of finches prepared by the author.

Analyses of the stomach contents of two species of Idaho lizards, with special reference to the Formicidae, A. C. COLE, JR. (*Ann. Ent. Soc. Amer.*, 25 (1932), No. 3, pp. 638–640).—A table is given reporting upon the stomach contents of 25 specimens each of *Sceloporus graciosus graciosus* Baird and Girard and *Uta levis* Baird and Girard taken at random. A second table reports upon the numbers of the 13 species of Formicidae removed from the stomachs of these lizards.

Laboratory and field manual of economic entomology, J. R. EYER (*Ann Arbor, Mich.*: *Edwards Bros.*, 1932, pp. [4]+132, figs. 12).—Part 1 of this mimeographed laboratory and field manual deals with insect anatomy, taxonomy, and metamorphosis (pp. 1–37), part 2 with control measures against insects (pp. 38–71), part 3 with laboratory studies of the literature of economic entomology and the preparation of an entomological thesis (pp. 72–78), and part 4 with field and laboratory studies of the more common insects injurious to crops (pp. 79–132).

The effect of radio waves on internal temperatures of certain insects, T. J. HEADLEE (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 313–319, fig. 1).—Contributing from the New Jersey Experiment Stations, the author points out that in the production of high temperature lethal effects on certain insects subjected to lines of force in an electrostatic field it is a matter of prime importance

that internal heat production should be as rapid as possible. It has been found that this speeding up of heat production can be accomplished through increasing the strength of the electrostatic field.

A list is given of 15 references to the literature.

Ecological studies in relation to the distribution and abundance of economic pests, H. L. SWEETMAN (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 320-325).—The author considers the methods and technics that can be used to obtain information from which forecasts of establishment, abundance, dispersal, control, and eradication of insect pests can be made. Reference is also made to predictions of abundance and dispersal of several insects that fit present known conditions. Controlled laboratory experiments where climate is simulated and quantitative data collected under natural conditions, together with correlative studies, are considered to afford a good means of analyzing and forecasting insect outbreaks. By means of such ecological investigations quarantine regulations and control and eradication measures could probably be made more effective.

A list is given of 36 references to the literature.

Plant pest handbook for Connecticut.—I, Insects, W. E. BRITTON (*Connecticut State Sta. Bul.* 344 (1933), pp. 65-182+XI-XVIII, figs. 88).—Following a brief account of insects and their injuries to plants (pp. 69, 70), the principal insect pests of cultivated plants are considered, brief notes being given on each, together with illustrations of the pests and in many cases the nature of their injury, the arrangement being alphabetical and according to the plants attacked. The handbook concludes with a list of formulas for insecticides and an index to the pests considered. It is based upon and replaces the spray calendar, the last revised edition of which as Bulletin 271 was issued in 1926 (E.S.R., 54, p. 642).

[Report of work in entomology in Connecticut] (*Connecticut State Sta. Bul.* 347 (1933), pp. 275-277).—This is a brief report of work under way with economic insects (E.S.R., 67, p. 559), including parasites of the oriental fruit moth, control of the Mexican bean beetle, the European pine shoot moth, potato flea beetle, gipsy moth, and European corn borer.

[Report of work in Florida with economic insects, nematodes, and rodents] (*Florida Sta. Rpt.* 1932, pp. 69-91, 191-195, 203-205).—The work reported upon (E.S.R., 67, p. 559) includes that with the Florida flower thrips and root knot, both by J. R. Watson; introduction and study of *Cryptolaemus montrouzieri* and *Leis conformis* lady beetles, by Watson and W. L. Thompson; lime-sulfur as a control for the purple scale, the control of the American grasshopper by nonarsenical poisons, rose chafers (*Macrodactylus angustatus*), and dry wood termites (*Neotermes castaneus*), all by Thompson; the bean jassid (officially known as the potato leafhopper), by A. N. Tissot; green citrus aphid (*Aphis spiraecola*), by Watson, Thompson, and Tissot; control of the pecan nut case bearer and its parasites, control of the walnut case bearer, and observations of the hickory shuck worm, the black hickory aphid (*Melanocallis caryaefoliae* (Davis)), the bark aphid (*Longistigma caryae* (Harr.)), mites (*Tetranychus* sp. ?), pecan cigar case bearer, twig girdler, walnut caterpillar, fall webworm, grape colaspis, and the blueberry fruit worm (*Acrobasis caccinii* (Riley)), considered under the heading of control of fruit and nut crop insects, by F. W. Walker; the larger plant bugs on citrus, pecan, and truck crops, including the southern green stinkbug and the leaf-footed bug and their natural enemies, by H. E. Bratley; insects of ornamentals, particularly the beet armyworm, by J. W. Wilson; insects and other animal pests of watermelons, including nematodes and field mice, by C. C. Goff; control of the cotton boll

weevil, by E. F. Grossman and P. W. Calhoun; and the granulate cutworm, the black cutworm, and *Cirphis latuiscula*, bean jassids (the potato leafhopper and others), aphids, the velvetbean caterpillar, cucumber beetles (*Diabrotica* spp.), the prevalence and control of the sugarcane borer in south Florida, and the prevalence and control of rodents under field and village conditions, all by R. N. Lobbrell at the Everglades Substation.

[Report of work with economic insects] (*Kansas Sta. Bien. Rpt. 1931-32*, pp. 84, 89-100).—This is a report of work (E.S.R., 64, p. 852) on bee investigations, by R. L. Parker; climate and injurious insect investigations, by R. C. Smith; Hessian fly, wheat stem maggot, and the wheat straw worm, by R. H. Painter; the corn ear worm and other insects injurious to corn, by D. A. Wilbur and H. R. Bryson; the apple curculio and the strawberry leaf roller, by Parker; corn leaf aphid attacking the sorghums and wireworms and other insects attacking the roots of staple crops, both by Bryson; the pea aphid, alfalfa thrips, variegated cutworm, clover leaf weevil, and grasshopper control, by R. C. Smith; insects injurious to grasses and allied plants, by Wilbur; shade tree insects, by Parker; codling moth investigations, by P. M. Gilmer, Parker, and G. A. Dean; the resistance of sorghums, corn, and wheat to insect injury, by Painter, A. M. Brunson, and J. H. Parker; and investigations of ground squirrels and rats, by G. E. Johnson.

A summary of the population of injurious insects in Kansas for 1931, R. C. SMITH (*Jour. Kans. Ent. Soc.*, 5 (1932), No. 3, pp. 65-92, figs. 21).—This report from the Kansas Experiment Station upon the occurrence of economic insects in Kansas in 1931 is presented in part in tabular and chart form.

Montana insect pests for 1931 and 1932, A. L. STRAND (*Montana Sta. Bul.* 269 (1932), pp. 28, figs. 4).—In this twenty-fourth report of the State entomologist of Montana (E.S.R., 64, p. 747) insect pests are considered under the headings of outlook for cutworms in 1933, grasshoppers, a new pest of wheat in Montana (*Blapstinus substriatus* Champ.), the Mormon cricket, the sugar beet webworm (officially known as the beet webworm), and fruit insects. A tabulation of insect pest correspondence for 1931-32 made up from inquiries received follows.

[Report of work in New Mexico with economic insects] (*New Mexico Sta. Rpt. 1932*, pp. 38-42, 43-46, 47, 48, 49, 51, 52, 66, figs. 4).—The work reported upon (E.S.R., 67, p. 50) includes that with codling moth sprays and baits; the giant apple root borer [*Prionus californicus* Mots.], an account of which pest by Crawford and Eyer has been noted (E.S.R., 60, p. 64); San Jose scale; grasshopper baits; nicotine tannate for control of onion thrips; psyllid yellows of potato produced by *Paratrioza cockerelli* and hopperburn produced by *Empoasca abrupta*; tomato insects; and arsenic spray residue on New Mexico apples.

[Notes on economic insects and insecticides] (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 509-517).—The contributions presented (E.S.R., 69, p. 73) include the following: Injury to Carrot, *Daucus carota*, by *Trifidaphis phaseoli* Pass.), by C. R. Cutright (p. 509); The Lesser Apple Worm (*Grapholitha prunivora* Walsh) in California, by H. H. Keifer (p. 509); *Thylodrias contractus* Mots., by C. L. Metcalf (pp. 509, 510); The Beech Scale and a Fungus [*Nectria coccinea*], by E. P. Felt, (p. 510); *Sitotroga* Production (pp. 510, 511) and Some Early Observations concerning *Trichogramma* (p. 511), both by S. E. Flanders; Worn-out Motor Oil for the Control of the San Jose Scale, by O. I. Snapp and J. R. Thomson (pp. 511, 512); Naphthalene for Midge Larvae in Tobacco Seed Beds, by B. B. Fulton (pp. 512, 513); Parasite Reared from the Elm Leaf Beetle and the Imported Willow Leaf Beetle [*Plagioderia versicolora*

Laich.], by T. H. Jones (p. 513); Decay of Apple Tissue in Storage Associated with Cherry Case Bearer [*Coleophora pruniella* Clem.] Injury, by C. L. Fluke and J. H. Lilly (pp. 513, 514); The Species of *Eumerus* on Long Island, by F. S. Blanton and F. J. Spruijt (pp. 514, 515); A Leaf Miner [Serpentine Leaf Miner] Attacking the Cultivated Onion, by H. M. Harris and H. D. Tate (pp. 515, 516); and Note on the Use of Microorganisms for the Production of Odors Attractive to the Dried Fruit Beetle, by J. D. Wildman (pp. 516, 517).

[Contributions on economic entomology] (*Ztschr. Angew. Ent.*, 19 (1932), Nos. 1, pp. 1-151, figs. 30; 2, pp. 161-311, figs. 53; 3, pp. 325-489, figs. 52; 4, pp. 497-618, figs. 50).—The contributions here presented (E.S.R., 67, p. 284) are as follows:

No. 1.—The Fluctuation of Insect Populations, by W. Zwölfer (pp. 1-21); Contributions to the Knowledge of the Morphology, Anatomy, and Biology of *Lophyrus pini* L., by G. Eliescu (pp. 22-67); A New Contact Insecticide ("For-estit"—Merck), by B. A. Marcus (pp. 68-84); The Normal Food of the Pine Spinner (*Dendrolimus pini* L.), by A. G. Lebedev and A. N. Savenkov (pp. 84-103) (E.S.R., 64, p. 543); The Epidemiology of the Pine Geometrid [*Bupalus piniarius* L.], by F. Schwerdtfeger (pp. 104-129); The Pine Geometrid and Its Parasites—Their Gradation, by K. Friederichs (pp. 130-143); Two New Braconid Parasites [*Phanerotoma buchneri* and *Agathis bischoffi*] of an Entomophagous Moth Enemy [*Holcocera pulverea* Hamps.] of the Lac Insect, by J. Fahringer (pp. 144-146); and The Biology of Beetles of the Genus *Sitona* Germ., by N. A. Grossheim,¹ abs. by L. Brammanis (pp. 147-151).

No. 2.—Contributions to the Knowledge of the Pest Fauna of Anatolia (Asia Minor)—II, On the Relation of the Grain Bug *Eurygaster integriceps* Put. to Biotic Environmental Factors, by W. Zwölfer (pp. 161-187) (E.S.R., 65, p. 852); Contributions to the Knowledge of the Morphology, Anatomy, and Biology of *Lophyrus pini* L., II, by G. Eliescu (pp. 188-206); Meteorological Observations in the Course of Control Work with the Pine Noctuid [*Panolis flammea*] in Middle Franconia through Use of Airplane and Motor Dusters in the Spring of 1931, by R. Geiger (pp. 207-222); On the Biology of *Nemeritis canescens* Grav. (Hymen. Ophion)—I, Rearing Experiments and Ecological Observations, by I. Beling (pp. 223-249); Contributions to the Biology of Nutrition in *Hylobius abietis* L. and Investigations of the Ecology and Climatology of Its Feeding Space, by K. R. Fischer (pp. 250-277); Contributions to the Knowledge of the Biology of *Agriotes lineatus* L. and *A. obscurus* L., by R. Langenbuch (pp. 278-300); On the Biology of *Ptinus tectus* Boield., by H. F. Friederichs (pp. 301-306); and Can *Calandra granaria* L. Breed in Flour? by K. T. Andersen (pp. 307-311).

No. 3.—Contributions to the Knowledge of *Lyctus linearis* Goeze, by T. Kojima (pp. 325-356); A knowledge of the Life History, Habits, and Morphology of Cereal-Infesting Halticinae, by H. Blunck (pp. 357-394); Studies of the Ecology and Epidemiology of the Cabbage Butterfly—I, The Influence of Temperature and Humidity upon the Development and Mortality of *Pieris brassicae* L., by H. Z. Klein (pp. 395-448); and A Decade of the Mite Disease of the Honeybee: Discovery, Investigation, and Control, by O. Morgenthaler (pp. 449-489).

No. 4.—Methods of Regulation of Temperature and Humidity, by W. Zwölfer (pp. 497-513); *Icerya purchasi* Mask. and *Novius cardinalis* Muls., a Population Study of the Fundamentals of Biological Control, by F. S. Bodenheimer (pp. 514-543); Evaluation of the Toxic Action of Insecticide Gasses by the

¹ Materials for the Study of the Genus *Sitona* Germ. [trans. title]. Trudy Mleev. Sadovo-Ogorod. Opytn. Sta. (Bul. Mleev. Hort. Expt. Sta.), No. 17 (1928), pp. 57, figs. 66.

Frequency in Pulsation of the Dorsal Vessel, by R. Kirschner (pp. 544-556); On the Biology and Technical Significance of Wood Wasps [Siricidae], by M. Ass and G. Funtikow (pp. 557-578); Experimental Contribution on the Biology of Mosquitoes, II, by O. Hecht (pp. 579-607) (E.S.R., 65, p. 656); The Rice Pyralid Problem in China [Asiatic Rice Borer and *Schoenobius bipunctifer* Walk.], by P. H. Tsai (pp. 608-614); The Identification of Geometrid Pupae Found in Pine Forests, by W. Zwölfer (pp. 614-617); and Bioclimatogram, by Zwölfer (pp. 617, 618).

Annual report of the entomological section for 1930-31, T. V. SUBRAMANIAM (*Mysore Dept. Agr. Rpt. 1930-31*, pp. 28-33).—This report upon the occurrence of and work with several of the more important insect enemies of crops in Mysore (E.S.R., 67, p. 286) includes an account of the mass rearing of *Trichogramma*, which has been found to parasitize the eggs of *Diacrisia obliqua* Walk., *Adisura atkinsoni* Mo., corn ear worm, *Euxoa* sp., and an unidentified moth on grasses.

[Entomological work in Sierra Leone], E. HARGREAVES (*Sierra Leone Dept. Agr. Ann. Rpt. 1931*, pp. 18-20).—A brief account of the occurrence of and control work with the important insects of the year.

[Entomological work in Tanganyika Territory] (*Tanganyika Ter. Dept. Agr. Rpt. 1931*, pp. 83-93).—The occurrence of and work with insects of economic importance in 1931 (E.S.R., 65, p. 547) is reported by A. H. Ritchie (pp. 83-86) and W. V. Harris (pp. 87-93).

Pests of cotton in the Callide Valley, D. O. ATHERTON (*Queensland Agr. Jour.*, 38 (1932), No. 6, pp. 488-492).—An account of the important enemies of cotton occurring in the Callide Valley, Queensland.

[Proceedings of the entomological section of the International Congress of Forestry Experimental Stations] (In *Verhandlungen des Internationalen Kongresses Forstlicher Versuchsanstalten*, Stockholm, 1929. Stockholm: Centraltryckeriet, 1930, pp. 629-682, figs. 10).—This consists of 11 contributions on forest entomology that were presented at the meeting held in Stockholm in July 1929.

The composition of some commercial insecticides, fungicides, bactericides, rodenticides, and weed killers, compiled by H. J. FISHER and E. M. BAILEY (*Connecticut State Sta. Bul. 346* (1933), pp. 209-268).—This is a compilation which supplements Bulletin 300 (E.S.R., 61, p. 355).

The rotenone content of derris root, cube root, and other plant materials, H. A. JONES (*Jour. Wash. Acad. Sci.*, 23 (1933), No. 1, pp. 36-46).—The rotenone content of 45 samples of derris root tested was found to range from 0 to about 7 percent, while that of 23 samples of cube root ranged from less than 1 to about 11 percent. The average of the 31 samples of derris root analyzed by the carbon tetrachloride method was 2.5 percent rotenone, while the average for the 22 samples of cube root analyzed by this method was 5.4 percent rotenone. It is pointed out that these averages should not be considered representative of derris and cube samples in general.

Loss in toxicity of deposits of rotenone and related materials exposed to light, H. A. JONES, W. A. GERSDORFF, E. L. GOODEN, F. L. CAMPBELL, and W. N. SULLIVAN (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 451-470, figs. 4).—This is an account of results of studies of rotenone conducted by the U.S.D.A. Bureau of Chemistry and Soils, the Bureau of Entomology cooperating, in connection with a list of 14 references to the literature.

“Rotenone, dihydrorotenone, rotenone hydrochloride, rotenone-bentonite (1:1), rotenone-lampblack (1:1), ground derris root, and powdered derris extract were each made into a paste with water and painted heavily on weighted glass slides. After the deposits had dried, the slides were weighed

again. One group of slides was exposed to direct sunlight for 10 days during April and May, a second group to sunlight for 20 days, a third group to arc light for 240 hours, a fourth group of the 3 pure compounds only to arc light for 480 hours, and a fifth group was kept in the dark at room temperatures. The deposits on these slides were tested against culicine mosquito larvae and goldfish to determine the percentage loss of toxicity resulting from exposure to light. In all cases the exposed deposits were decidedly less toxic than the unexposed, and with one exception the loss of toxicity increased with increasing exposure. Rotenone, rotenone-bentonite, derris root, derris extract, and rotenone hydrochloride lost more than half of their toxicity during 10 days' exposure to sunlight. Their toxicity was practically destroyed by the exposure to arc light. Since dihydrorotenone lost only one fourth to one third of its toxicity during the first 10 days' exposure to sunlight, it was distinctly more resistant to detoxication during this period than rotenone. However, at the end of 20 days in sunlight and after exposure to arc light it had lost toxicity to about the same extent as rotenone.

"Lampblack markedly reduced the loss of toxicity of rotenone during the first 10 days' exposure to sunlight, and prevented further loss during the last 10 days. It also gave some protection to rotenone under arc light. Neither bentonite nor the substances occurring with rotenone in powdered derris root and derris extract protected rotenone from loss of toxicity. The unexposed powdered derris extract containing about 25 percent rotenone was as toxic to mosquito larvae as pure rotenone. It was shown that the photochemical decomposition of dry rotenone, which results in loss of its toxicity to insects and fish, does not take place in the absence of oxygen."

Accidental sodium fluoride poisoning, T. P. SHARKEY and W. M. SIMPSON (*Jour. Amer. Med. Assoc.*, 100 (1933), No. 2, pp. 97-100).—The authors report upon one fatal case and seven nonfatal cases of accidental poisoning with sodium fluoride, widely employed as an insecticide, that occurred in a hospital in Dayton, Ohio, within one month. The report emphasizes the importance of care in keeping it separate from containers used for saline solutions or baking powder.

Some factors affecting the efficiency of contact insecticides, II, III (*Contrib. Boyce Thompson Inst.*, 4 (1932), No. 1, pp. 107-117, figs. 2; 5 (1933), No. 1, pp. 115-127, figs. 4).—These parts continue the previous contribution (E.S.R., 65 p. 357.)

II. Chemical and toxicological studies of pyrethrum, A. Hartzell and F. Wilcoxon.—A method is described for the determination of comparative toxicity to the bean aphid of samples of pyrethrum flowers without the use of a wetting agent. The average deviation between duplicate determinations made on the same day by this method was 6.4 percent kill. A loss in pyrethrin content of pyrethrum flowers was caused by heat, sunlight, ultraviolet light, and natural aging. In all cases a decrease in pyrethrin content as determined chemically corresponded to a decreased toxic effect on insects.

No lasting protection was afforded by spraying nasturtium plants with pyrethrum solutions and infesting them with the bean aphid after the plants had dried. Refluxing a pyrethrum solution in methyl alcohol for four hours did not result in a significant loss in toxicity. Pyrethrum concentrates were toxic to a number of cold-blooded animals, including species representing 10 orders of insects, when applied externally to the integument. Such concentrates were toxic even when applied locally to regions of the body far removed from vital organs. These concentrates injected into the body cavity led to almost immediate occurrence of toxic symptoms. Preliminary results indi-

cate that there is an axial gradient in susceptibility to pyrethrum when extracts are applied to the tomato worm larvae, the anterior region being most susceptible. When rose chafer adults in a moribund state from pyrethrum intoxication were exposed to a higher temperature, the processes of recovery and death were both accelerated.

The account is presented in connection with a list of 19 references to the literature.

II. *Further chemical and toxicological studies of pyrethrum*, F. Wilcoxon and A. Hartzell.—“A method is described for obtaining samples of the pyrethrins free from accompanying impurities which is simpler than methods described previously, and which does not require the conversion of the pyrethrins into a derivative and their subsequent regeneration. In the course of this work samples have been obtained differing widely in the ratio of pyrethrin I to II. Toxicity tests using these samples on *Aphis rumicis* indicated that I is far more toxic than II.”

Summer oil emulsions against the oriental fruit moth and other insects, S. W. FROST (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 334-344, pl. 1).—In laboratory tests with 2 percent oil emulsions under severe conditions at the Pennsylvania Experiment Station, the author failed to secure as high a kill as was obtained in the work in the preceding year (*E.S.R.*, 67, p. 572). Several commercial oil emulsions were said to have been used without injury on peach and apple, and these in combination with sulfur had been used on peach and in combination with 3-3-50 Bordeaux on apple without injury. A 2 percent oil emulsion without lead arsenate gave no control of codling moth. A 5 percent oil impregnated with lead, sulfur, lime dust gave considerable reduction of oriental fruit moth injury.

Experiments with tar distillate sprays against fruit aphids and associated insects, F. Z. HARTZELL, P. J. PARROTT, and S. W. HARMAN (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 474-480).—This is a report of field trials of tar distillate sprays conducted in a number of orchards in western New York in 1932 to determine their effects upon the trees and efficiency in controlling fruit insects.

“Four American and four European brands were used in the experiments. Concentration of tar washes in the applications on apples generally varied from 5 to 7.5 percent, although mixtures containing 2 and 3 percent were tried on a few trees. Except in the case of one plat that was sprayed very late in the fall, all applications on the apple were made in the spring not later than the gray-tip stage of the buds. On sweet cherry and pear, the mixtures contained 4 and 5 percent of the emulsions respectively.

“Control of the rosy apple aphid was secured in all trials when the concentrations of tar washes were not less than 5 percent. Lower concentrations generally proved less effective. A fall application did not give as high control as spring treatments. In practically all instances, the control of rosy apple aphid by spring applications of tar washes (not less than 5 percent) was similar to that effected by nicotine sulfate (1:800). A single experiment indicates that these materials may prove effective against the black cherry aphid. Tests with one brand indicate that in severe infestations tar distillate sprays are not as effective as lubricating oil emulsions for the control of San Jose scale. Four brands, used at 5 and 7.5 percent, appear to be very effective on oyster-shell scale. Tar washes (7.5 percent) in the tests were but slightly inferior to nicotine sulfate (1:400) in lubricating oil against the eye-spotted budmoth, while lower concentrations of the washes produced moderate control. The results with apple redbug indicate that rather low efficiencies are to be expected from tar washes (7.5 percent) when used against

this insect. One brand (5 percent) proved destructive to the eggs of pear psylla. At the concentrations used none of the materials proved injurious to the buds or wood of apple, sweet cherry, and pear during 1932."

Tests with tar distillate sprays for foliage applications, F. Z. HARTZELL (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 480-486).—At the New York State Experiment Station tar distillates "were tested as foliage sprays on numerous varieties of apples in an effort to determine their value for codling moth and apple aphid control. Four brands of tar washes were used with standard fungicides, viz, lime-sulfur (1-40), Bordeaux mixture (4-8-100), and dry-mix sulfur and lime. In the tests on young McIntosh trees comparisons were made with untreated trees and those sprayed with each fungicide mixed with arsenate of lead. In trials on many varieties of bearing trees, comparisons were made between those of the same variety sprayed with the same fungicide in which arsenate of lead replaced tar distillates. These latter were found apparently compatible with the three fungicides.

"The results against apple aphid were irregular and contradictory, so no marked value of these materials was noted. Based on 'wormy' apples, arsenate of lead proved superior in every one of the 16 comparisons, while the same material gave better control in 15 of the 16 pairs of tests when the total codling moth injuries were considered. The problem of spray residue was not eliminated. Leaf injury, russetting, and pitting of the fruit of a number of varieties leads to the conclusion that the causes of these injuries must be determined and eliminated before much progress can be made in experimentation with tar distillate sprays for control of the codling moth."

Naphthalene as a fumigant for the immature stages of clothes moths and carpet beetles, G. W. HERRICK and G. H. GRISWOLD (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 446-451).—The authors have found that naphthalene flakes at the rate of from 2 to 3 oz. to 5 cu. ft. proved toxic to the eggs and larvae of the webbing clothes moths when confined for a sufficient length of time in a tight trunk or in a box. Moth balls at the rate of 8 oz. to 5 cu. ft. proved toxic to the larvae of clothes moths when confined in a tight box for a considerable period of time. The results with the immature stages of carpet beetles (the black carpet beetle and the varied carpet beetle) were only partially satisfactory.

The Collembola-Symphyleona of Australia.—A preliminary account, H. WOMERSLEY (*Aust. Council Sci. and Indus. Res. Pam.* 34 (1932), pp. 47, figs. 19).—An illustrated systematic account of the Collembola of Australia, with tables for the separation of families and genera and a list of 111 references to the literature. It includes a foreword by R. J. Tillyard.

The Chrysopidae (Neuroptera) of Canada, R. C. SMITH (*Ann. Ent. Soc. Amer.*, 25 (1932), No. 3, pp. 579-600, pl. 1).—Thirty-four forms of Chrysopidae, representing four genera, are recognized, of which two are described as new.

Termites of western Mexico, S. F. LIGHT (*Calif. Univ. Pubs. Ent.*, 6 (1933), No. 5, pp. [4]+79-164, pls. 5, figs. 33).—The present paper reports upon the important systematic and faunistic results of investigations of the termites of western Mexico, involving descriptions of 12 new species and 1 new genus in addition to the 4 new species of *Amitermes* previously described (*E.S.R.*, 64, p. 750). In addition, 2 doubtful species of long standing have been rediscovered and defined, and 6 other species not previously known to exist there have been added to the Mexican fauna. A list of 34 references to the literature is included.

The use of a modified McIndoo olfactometer for the European earwig, *Forficula auricularia* (Dermap.), G. BEALL (*Ent. News*, 44 (1933), No. 1, pp.

6-10).—A report upon an attempt made during the winter of 1930-31 to test the chemotropic responses of the European earwig.

Further studies of the relative toxicity of poisons for grasshopper baits, C. H. RICHARDSON and G. A. THURBER (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 494-499).—In work at the Iowa Experiment Station adult differential grasshoppers "were fed determined quantities of a standard bran-molasses bait which contained known concentrations of arsenious oxide, sodium fluoride, cuprous cyanide, zinc phosphide, sodium fluoaluminate, acid lead acetate, and nicotine tannate. The estimated minimum lethal dose of the first three compounds is 0.11 mg per gram of body weight, for zinc phosphide it is 0.52 mg/gram. Acid lead arsenate is much less toxic, the minimum lethal dose being approximated as 2 to 4 mg/gram; sodium fluoaluminate is evidently less toxic than acid lead arsenate. Nicotine tannate has a low but undetermined toxicity for this insect. The toxicity of some of these compounds for other insects is discussed briefly. Cuprous cyanide and zinc phosphide seem worthy of further experimental investigation."

Sodium fluosilicate as a poison against the hoppers of *Locusta migratoria migratorioides* R. & F. in Nigeria, F. D. GOLDING (*Bul. Ent. Res.*, 23 (1932), No. 4, pp. 449-461).—In combating *L. migratoria migratorioides*, sodium fluosilicate was found to be as effective as sodium arsenite in baits when used at the same concentration, namely 2.44 percent, but was slower in its action.

Another oriental mantis well established in the United States (*Tenodera angustipennis* Saussure, Orthoptera: Mantidae), F. M. JONES (*Ent. News*, 44 (1933), No. 1, pp. 1-3, pl. 1).—The mantis *T. angustipennis*, native of China, Japan, and Chosen (Korea) not hitherto recorded from the United States, is reported as having been first found in September 1930, near Vandyke, New Castle County, Del.

The food plants of the leafhoppers, E. D. BALL (*Ann. Ent. Soc. Amer.*, 25 (1932), No. 3, pp. 497-501).—The author concludes that recent additions to the knowledge of food plant relations in the leafhoppers indicate a very definite and restricted food habit for the great majority of species, the few exceptions forming the nucleus of a small group of injurious forms. While large groups are almost exclusively grass feeders, others that have been reported as grass feeders have other food habits. In general, all the members of a natural group will be found to be either grass feeders or all of them will have other food habits.

Spray tests for the white apple leafhopper, *Typhlocyba pomaria*, W. J. SCHOENE (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 325-328).—Contributing from the Virginia Experiment Station, the author reports on spray experiments to control the second brood of the white apple leafhopper (*T. pomaria*) on apple trees, in which nicotine combined with Penetrol or summer oil was effective.

Erythroneura collected on apple with description of a new species, R. H. BEAMER (*Jour. Kans. Ent. Soc.*, 5 (1932), No. 2, pp. 62-64).—Fifteen species are recorded as taken from the apple, of which one, collected in Kansas, Arkansas, and Pennsylvania, is described as new under the name *E. dowelli*.

A review of the Nearctic species of *Macropsis* (Homoptera, Cicadellidae), E. P. BREAKEY (*Ann. Ent. Soc. Amer.*, 25 (1932), No. 4, pp. 787-844, pls. 4, figs. 3).—The author recognizes 29 species and 3 varieties of this genus of Cicadellidae as occurring in North America, none of which is known to be a pest of economic importance.

Ecological studies on aphides infesting the potato crop, W. M. DAVIES (*Bul. Ent. Res.*, 23 (1932), No. 4, pp. 535-548, fig. 1).—This is a report of ecological studies of aphids attacking potatoes in Wales, commenced in 1928. The

species studied include the green peach aphid, *Macrosiphum gei* Koch, and *Myzus pseudosolani* Theob.

The identity of the black pecan aphid, *Melanocallis caryaefoliae* (Davis), T. L. BISSELL (*Ann. Ent. Soc. Amer.*, 25 (1932), No. 4, pp. 730-735, figs. 6).—Contributing from the U.S.D.A. Bureau of Entomology and the Georgia Experiment Station, in cooperation, the author reports upon a study made of the types of *Aphis fumipennella* Fitch and *A. caryaefoliae* (Davis) in comparison with many additional species taken from pecan and other hickories. A comparison of the *A. caryaefoliae* type with aphids from hickory and pecan from several southern States has shown the black pecan aphid to be this species. *A. fumipennella* is known only from the imperfect type specimen and cannot now be placed in any genus.

Control of the black hickory aphid, F. W. WALKER (*Ga.-Fla. Pecan Growers Assoc. Proc.*, 1932, pp. 39-43).—In control work some of the best results have been obtained with nicotine sulfate 40 percent, using sulfonated oxidation products of petroleum (Penetrol) as spreader and activator. The formula giving the greatest percentage of kill of this insect for the least cost per gallon of finished spray consists of nicotine sulfate 40 percent 1:5,000 and Penetrol 1 qt. in 50 gal. 0.5 percent. In making this spray the nicotine sulfate and the Penetrol should be combined and then thoroughly mixed with about three times their volume of water before putting into the spray tank.

Five new species of *Anuraphis* and *Aphis*, A. N. TISSOT (*Fla. Ent.*, 16 (1933), No. 4, pp. 49-60, figs. 44).—Contributing from the Florida Experiment Station, the author presents descriptions of five new aphidid species, namely, *Anuraphis arundinariae* from *Arundinaria tecta*, *Anuraphis iteae* from *Itea virginica*, *A. minima* from *Prunus* spp., *Aphis astericola* from *Aster* sp., and *A. floridanae* from *Lactuca floridana*, all from Florida.

The presence of *Anuraphis persicae niger* Smith in France [trans. title], R. PUSSARD (*Bul. Soc. Ent. France*, 37 (1932), No. 7, pp. 110-113).—Notes are presented on *A. (Brachycaudus) amygdali* Buckt. and the black peach aphid, two morphologically and biologically distinct species heretofore confused.

The efficiency of tar distillate sprays in controlling San Jose scale in 1932, W. S. HOUGH (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 470-473).—This is a report of the results obtained by the Virginia Experiment Station in the second season's experiments with sprays containing coal tar distillates of English and American origin, which were found to confirm the results of the preceding year (*E.S.R.*, 67, p. 708). The higher concentrations may give control of San Jose scale comparable to that obtained with a standard petroleum oil spray of 3 percent oil. A combination of coal tar oil and petroleum oil against aphid eggs and scale in the dormant season is suggested.

Biological study of the Coccidae of the western basin of the Mediterranean, A. BALACHOWSKY (*Étude Biologique des Coccides du Bassin Occidental de la Méditerranée. Paris: Paul Lechevalier & Sons, 1932, pp. 214+LXXI, [figs. 68]*).—Part 1 of this work reports upon a biogeographical study of the Coccidae of North Africa (pp. 11-119); part 2 deals with the factors influencing population (pp. 121-155) and part 3 with observations of parasites and parasitism of the Coccidae, including a bibliography of 14 pages (pp. 157-214); and part 4 consists of (1) a revised catalogue of the Coccidae of North Africa (Algeria, Tunisia, Morocco, Sahara), representing 169 forms (pp. I-XLIV), and (2) a preliminary list of the Coccidae of the Maritime Alps, of Var, of Bouches-du-Rhône, of the Upper Alps, of the Lower Alps, and of Corse (Corsica) (pp. XLV-LXVII).

An account of my studies in the biology of *Pieris rapae*, O. QUERCI (*Ent. Rec. and Jour. Variation*, 44 (1932), No. 12, pp. 168-176).—Observations made

of the imported cabbage worm in the vicinity of Philadelphia are reported under the headings of breeding from the eggs, temperature experiments, and life history of *P. rapae* at Philadelphia in the year 1932, and other observations.

The codling moth in New York, P. J. PARROTT (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 358-363).—This is a discussion of the importance of the codling moth to the apple industry of New York State and the status of spray practices.

A field and laboratory technique for toxicological studies of the codling moth, E. H. SIEGLER and F. MUNGER (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 438-445, pls. 2, fig. 1).—The authors describe the so-called "apple plug" method, devised for the purpose of minimizing certain difficulties experienced in insecticide tests of the codling moth. In using the "apple plug" method, small plugs of apple, uniformly sprayed with the insecticide under test, are sealed in glass cylinders. One codling moth egg is confined with each plug and, upon hatching, the larva encounters the insecticide as it attempts to gnaw its way through the skin of the fruit.

The technique of codling moth field experiments, C. R. CUTRIGHT and H. F. DIETZ (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 392-401, figs. 3).—This is a detailed discussion of the principles that should govern the planning of codling moth field experiments.

A summary of three years' experiments on the control of codling moth in southwestern Michigan, F. SHERMAN III (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 383-392).—Tests at the Michigan Experiment Station extending over a period of three years have shown that lead arsenate sprays may be expected to control the codling moth in heavily infested Michigan orchards.

"Summer oil emulsions and the summer oil-nicotine sulfate combinations have also resulted in good control under severe infestations. Following the use of lead arsenate sprays it was necessary to wash the fruit. This, it is shown, usually can be escaped if summer oils or the summer oil-nicotine sulfate combination is used for the summer brood sprays. It is shown that moth traps furnish valuable information which may be utilized in the spraying program. The importance of reducing codling moth population by supplementary control measures in severely infested orchards is emphasized."

The codling moth in southern Kansas and recommendations for its control, P. M. GILMER and R. L. PARKER (*Kansas Sta. Bul.* 263 (1932), pp. 29, figs. 6).—After a brief discussion of the importance of the codling moth and a description of its several stages, its life history in southern Kansas is briefly considered, followed by an extended account of methods of controlling the pest in that area with reference to supplementary measures and orchard income as affected by spraying practice.

It is pointed out that because of the heavy infestation by the codling moth in the Arkansas River Valley of southern Kansas a considerably different spray schedule and supplementary control program are required than elsewhere in the country. In that section the codling moth ordinarily has three generations. The studies have shown that "the first adults may be expected any time after April 15, the first eggs between May 5 and 15, and first-brood larvae from May 12 until late in June or early in July. First-brood adults may be expected any time after June 10, with the peak of emergence about July 1 to 10. The peak of second-brood adults may be looked for from August 10 to 20, and the peak of third-brood eggs about September 1. Practically all the larvae of the third brood hibernate, a very small number occasionally transforming to produce a small fourth brood of larvae all of which hibernate.

"The most effective spray program against the codling moth has been found to be the use of acid lead arsenate at the rate of 2 lb. to 50 gal. of water,

applied at the average rate of from 18 to 30 gal. per tree per spray, according to tree size, in 7 sprays. These sprays should consist of a calyx or petal-fall spray; 4 sprays applied to control the first brood, approximately at 2-week intervals after the calyx, the first coinciding in time with the first blotch spray; 2 sprays applied during July and August to control second-brood larvae; and, in especially bad years where control of early broods has been unsatisfactory, a late spray about August 15 to 20 to control the third-brood larvae. Supplementary measures, such as the use of chemical bands, proper pruning, cultivation, and packing-house and lug-box sanitation, are valuable aids in reducing the numbers of larvae that succeed in transforming into adults.

"Actual comparison in 1929 showed the cost of the recommended spray procedure to be approximately \$2.50 per tree per season, as against approximately 75 c. per tree per season under the present commercial practice. The income under average conditions of set and market, with trees mature and in good bearing, will be approximately \$7.28 per tree by the recommended method and \$4 per tree by the usual method. Increased income by the recommended method above spray costs amounts to approximately \$1.50 per tree, representing its financial advantage in average years over the usual method in use. A spray calendar for apples in the Arkansas River Valley of Kansas is included."

The net gain during the last decade in codling moth control information as indicated by experience under conditions especially favorable to the insect, G. M. LIST (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 373-377).—Contributing from the Colorado Experiment Station, the author points out that extreme codling moth conditions determine the true value of control suggestions in a short period of time. "The proper use of arsenate of lead remains our most effective single control. Oil sprays in themselves are not a satisfactory control, but in certain combinations are of value. They complicate the spray residue problem and under many conditions are injurious to the fruit. Bait traps as a means of timing the application of sprays and the chemically treated bands are two of the most important recent developments. The use of the egg parasite, *Trichogramma minutum* Riley, has not shown a definite control under Colorado conditions. Unless more effective controls can be developed, some fruit growing areas must be classed as marginal."

Experimental results in codling moth control with late summer oil applications, C. R. CUTRIGHT and J. S. HOUSER (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 380-383).—In work extending over a period of 4 years the authors have found that refined oil sprays applied in midsummer are not as effective as arsenate of lead applied at the same time for codling moth control. The ratio of entrances to stings is always higher on oil-sprayed plats than on those sprayed with arsenate of lead. The oils used in midsummer, however, have been quite effective in lowering the arsenical residues.

Chemically treated bands, M. D. FARRAR and W. P. FLINT (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 364-368, fig. 1).—The authors find in studying over a 5-year period in Illinois that the cold dipped, corrugated paper band (powdered beta naphthol 1 lb., 200-300 seconds viscosity oil 1.5 pt., gasoline 1 pt.) has been as effective in stopping codling moth emergence as the hot dipped band. The cold band has advantages as to uniformity of deposit, fire hazard, and ease of preparation. Now cold dipped formulas of high efficiency are given.

The *Pyrausta* corn borer in the Netherland East Indies (*P. nubilalis* Hbn.) [trans. title], C. J. H. FRANSSSEN (*Landbouw [Buitenzorg]*, 8 (1932), No. 4, pp. 266-284, figs. 3; *Eng. abs.*, pp. 283, 284).—The author reports that comparative morphological investigations of moths from Java, Celebes, the Philippine Islands, and the United States have shown the species observed in the

islands of Java, Sumatra, and Borneo to be identical with the common European corn borer. Observations of its life history made at Sengkang in the Celebes and Buitenzorg in Java are recorded. It is said to be of little importance in the Netherland East Indies, only two serious outbreaks in Java having come to the author's attention.

Experimental destruction of the eggs and larvae of the wax moth (*Galleria mellonella* L.) by use of insecticides [trans. title], A. BORCHERT and K. VÖHRINGER (*Berlin. Tierärztl. Wchnschr.*, 48 (1932), No. 50, pp. 805-807).—Tests made of sulfoliquid, areginal, hexachlorethane, and Cyanogas indicate that all four are effective in destroying the eggs and larvae of the wax moth.

The description and biology of *Nepticula braunella* new species (Lepidoptera—Nepticulidae), a species of leaf miner on *Prunus ilicifolia* Walp. and the variety *integrifolia* Sarg., W. W. JONES (*Calif. Univ. Pubs. Ent.*, 6 (1933), No. 4, pp. 49-78, figs. 10).—This account deals with the Pacific coast species *N. braunella* n. sp., which attacks *P. ilicifolia* and *P. ilicifolia integrifolia* and is typical of half a dozen California species previously studied comparatively. There are said to be two main broods a year, although stragglers in the larval stage are encountered all the year round depending on the weather. A list is given of 85 references to the literature.

Insect enemies of the corn earworm (*Heliothis obsoleta* Fabr.), T. F. WINBURN and R. H. PAINTER (*Jour. Kans. Ent. Soc.*, 5 (1932), No. 1, pp. 1-28).—In a study of the literature at the Kansas Experiment Station, a list of 47 references to which is included, 82 species of insects were found recorded as enemies of the corn ear worm. Those most important in the Kansas region are the egg parasites *Trichogramma minutum* Riley and *Telenomus heliothides* (Ashm.), the larval parasite *Microplitis croceipes* (Cress.), and the predacious bug *Orius insidiosus* (Say). The parasitism of the ear worm on corn is very small, showing that a parasite is needed which has a long ovipositor or habits which will enable it to reach the corn ear worm larvae in spite of the protecting shucks. At the station two new insect enemies of the corn ear worm were found, namely, *Chrysopa plorabunda* Fitch and *Microplitis* sp. near *melianae* Vier.

Clothes moths and carpet beetles, T. J. HEADLEE (*New Jersey Stas. Circ.* 264 (1933), pp. 4).—A brief practical account.

The relative toxicity of nicotine, anabasine, methyl anabasine, and lupinine for culicine mosquito larvae, F. L. CAMPBELL, W. N. SULLIVAN, and C. R. SMITH (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 500-509, fig. 1).—The authors have found that, based on the concentration required to kill 50 percent of a population of culicine mosquito larvae in 8 hours at 29.3° C. (84.7° F.), the relative toxicity of four alkaloids is as follows: Nicotine 100, anabasine 38, methyl anabasine 21, and lupinine 6 (?). According to unpublished observations of others, nicotine and anabasine may be equally effective against aphids. Nicotine and anabasine are much less toxic than rotenone against mosquito larvae and house flies. Methods for preparing the alkaloids and for obtaining, rearing, counting, and transferring mosquito larvae are described.

Automatic distribution of paris green for malaria control, P. F. RUSSELL (*Jour. Parasitol.*, 19 (1933), No. 3, pp. 215-224, figs. 6).—The author reports upon two experiments conducted with an automatic distributing machine from which a mixture of sand and paris green falls on a stream continuously for some hours each week. A large proportion of the anopheline mosquito larvae breeding in streams were killed by the paris green so distributed, even at a distance of 300 m downstream.

Bloodsucking and non-bloodsucking flies in relation to human welfare (*Ann. Ent. Soc. Amer.*, 25 (1932), No. 3, pp. 603-630).—The papers presented at a symposium held at the annual meeting of the Entomological Society of America at New Orleans, La., here presented include the following: Bloodsucking Flies (Exclusive of Culicidae) in Relation to Human Welfare, by H. H. Schwardt (pp. 603-613); Mosquitoes in Relation to Human Welfare, by E. H. Hinman (pp. 613-623); and Non-bloodsucking Flies as Vectors of Pathogenic Micro-organisms, by W. B. Herms (pp. 623-628). A discussion of the symposium papers, by E. C. Faust, follows (pp. 629, 630).

New method in sand fly studies (Diptera: Chironomidae), D. G. HALL, J. B. HULL, and W. E. DOVE (*Ent. News*, 44 (1933), No. 2, pp. 29-32, pl. 1).—This contribution describes methods for obtaining adult sand flies, the preservation of the natural shape and color of such adults, and the preparation of immature stages for microscope slides. An automobile headlight trap for collecting insects is described, together with a preservative fluid which gives natural shape and color in specimens of sand flies.

The salt marsh sand fly problem (Culicoides), W. E. DOVE, D. G. HALL, and J. B. HULL (*Ann. Ent. Soc. Amer.*, 25 (1932), No. 3, pp. 505-522, pls. 3, figs. 2).—This is a preliminary account of bloodsucking midges occurring along the Atlantic and Gulf coast littorals. Methods of combating these pests are outlined.

Influence of light on the gorging of *Culex pipiens* L., P. TATE and M. VINCENT (*Nature [London]*, 130 (1932), No. 3279, pp. 366, 367).—The results of studies of the effect of light upon engorging mosquitoes are said to have shown definitely that under experimental conditions in England the common house mosquito *C. pipiens* will engorge readily when placed in the dark after prolonged exposure to light, but if kept continuously in the dark will only rarely engorge.

Susceptibility of English *Culex pipiens* L. to infection with bird malaria, P. TATE and M. VINCENT (*Nature [London]*, 130 (1932), No. 3286, p. 630).—In experimental transmission of bird malaria by *C. pipiens* in England, the authors utilized the method of engorgement described in the contribution above noted. In the course of the experiments 393 mosquitoes engorged on birds heavily infected with the malaria parasite, *Plasmodium relictum* Grassi and Feletti, of which 131 were dissected and 72 (55 percent) found infected. Many mosquitoes showed more than 20 cysts on the stomach, and the salivary glands were heavily infected with this protozoan. Infected mosquitoes readily transmitted the parasite to healthy canaries. This is considered to have been the first published record of the transmission of bird malaria by *C. pipiens* in England.

Dragon-flies predacious on *Tabanus* spp. (Dipt.: Tabanidae), E. H. HINMAN (*Ent. News*, 44 (1933), No. 2, pp. 49, 50).—The so-called green jacket dragon fly, *Mesothemis simplicicollis* Say, was observed by the author in southern Louisiana to feed extensively on the horseflies *T. conterminus* Walk. and *T. nigrovittatus* Macq.

The life histories of two horse-flies, H. H. SCHWARDT (*Ann. Ent. Soc. Amer.*, 25 (1932), No. 3, pp. 631-637).—This is a report of studies of the life histories of the black horsefly and *Tabanus trimaculatus* P. de B., conducted in the period 1929-1931 at Fayetteville, Ark., in continuation of earlier work (E.S.R., 63, p. 753; 66, p. 557).

The large narcissus fly, *Merodon equestris* Fab. (Syrphidae), W. E. H. HODSON (*Bul. Ent. Res.*, 23 (1932), No. 4, pp. 429-448, pl. 1, fig. 1).—This

is a review of the history, morphology of the immature stages, and biology of, and control measures for, the narcissus bulb fly.

Preliminary report on a study of the biology of *Lixophaga diatraea* Tns., L. C. SCARAMUZZA (*Asoc. Téc. Azucareros Cuba, Proc. Ann. Conf.*, 4 (1930), pp. 59-63).—This is an account of the tachinid *L. diatraea*, the most important and effective larval parasite of the sugarcane borer in Cuba, Puerto Rico, and some of the other islands of the West Indies, parasitism in Cuba reaching as high as 40 percent during spring and summer. "The flies are larviparous, and borer larvae can be inoculated by dissecting gravid females and placing maggots on the host. There are three larval stages, of which part of the first and second are attached to the trachea of the host while the third is always free within the host body. Six to seven days are required for the prelarviposition period, 5.5 to 13 days in the larval stages, and 9 to 11 days in the pupal stage, making 20.5 to 30 days for the complete life cycle."

The relative toxicity of trisodium arsenite and arsenious acid to the house fly, *Musca domestica* L., A. M. PEARSON and C. H. RICHARDSON (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 486-493).—In studies in Iowa, solutions of arsenious acid and trisodium arsenite of various pH values were fed quantitatively to newly emerged adult house flies. "The solutions contained 15 g of sucrose per 100 cc. Under these conditions, the toxicity of arsenious acid (pH 6.58 to 6.96) was indistinct from that of trisodium arsenite (pH 11.3 to 11.4), possibly the result of buffer action within the digestive tract. The minimum lethal dose for the two forms of trivalent arsenic was 0.14 mg arsenic per gram of body weight. This is comparatively a large minimum lethal dose for an insect. Arsenious acid solutions were not repellent at any arsenic or hydrogen-ion concentration used; trisodium arsenite solutions of equivalent As concentration were not repellent at pH 11.3 and 11.4, but were distinctly repellent at higher pH values. In practice, no more alkali should be added to a house fly bait than is necessary to hold the trivalent arsenic in solution."

The biology and economic status of New Zealand Muscidae and Calliphoridae.—Part I, Historical review, D. MILLER (*Bul. Ent. Res.*, 23 (1932), No. 4, pp. 469-476).—This first part consists of a historical review presented in connection with a list of 42 references to the literature.

Dispersal of the apple maggot—1932 studies, C. R. PHIPPS and C. O. DIRKS (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 344-348, pl. 1, fig. 1).—This contribution from the Maine Experiment Station records the recovery of 130 marked apple maggot flies out of a total of 3,152 which were released in one site. These marked flies were recovered at distances varying from 65 to 233 yards from the point of release. Although released in unsprayed trees bearing many apples, the marked flies soon left them, as they did unsprayed non-bearing trees in similar experiments in 1931. Marked flies released in young sprayed apple trees were not recovered.

Notes on the biology of the apple maggot, C. R. PHIPPS and C. O. DIRKS (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 349-358, pls. 2, figs. 4).—A further contribution from the Maine Experiment Station reports upon the life history of the apple maggot in that State. The observations made indicate that the time of fly emergence is governed by a number of factors, such as variety of fruit in which the larva develops, nature of the soil, location, and amount of rainfall during the emergence period.

"In order to obtain large quantities of the larvae for various purposes a special trap was developed. A small fall or second brood of flies has been produced in our cages each year in one section of the State but not in the others where the soil is heavier. Only larvae which develop in early or summer va-

rieties transform to flies the same season. Practically all the second generation flies appear during the first 2 weeks in October, hence they are not of economic importance. Two-year cycle flies are likewise recorded. Counts covering the daily sex records of nearly 23,000 flies in 1932 indicate that the period during which the males and females emerge in nearly equal numbers coincides with the peak of emergence."

The host relations of our cherry fruit flies, H. GLASGOW (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 431-437, pls. 2).—In this contribution from the New York State Experiment Station, the author reports that *Prunus serotina* appears to be the principal native host for the cherry fruit fly, while the black cherry fruit fly is confined chiefly to *P. pennsylvanica*. These two fruit flies are not well adapted to the native chokecherry, *P. virginiana*, and this fruit appears to be of little importance as a host for either species.

Insects in relation to fruit injuries, A. A. GRANOVSKY (*Minn. Hort.*, 59 (1931), No. 3, pp. 60, 61, figs. 6; *abs. in Minnesota Sta. Rpt. 1932*, p. 34).—In this brief general account mention is made of the carrying by the apple maggot of a bacterial organism that causes and hastens the decay of apples in storage.

Records of some insects predacious on *Epilachna corrupta* Muls. in Mexico, C. C. PLUMMER and B. J. LANDIS (*Ann. Ent. Soc. Amer.*, 25 (1932), No. 4, pp. 695-708, fig. 1).—A report is given of observations made during the summer of 1930 of enemies of the Mexican bean beetle on bean foliage and wild solanaceous plants in Mexico.

Preliminary tests with liquid bait in Japanese beetle traps, F. W. METZGER (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 411-414, pl. 1).—This is an account of an attempt made to devise a method of maintaining the attractiveness of the geraniol and eugenol baits over a considerable period of time when exposed in the field. The results indicated that when wicks of a certain size were used in traps of two types, more beetles were captured than in check traps containing the bran-molasses mixture with the attractants added.

Economic status of the Japanese beetle in 1932, L. H. WORTHLEY and C. W. STOCKWELL (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 405-410).—This is a summary of the economic status of the Japanese beetle at the end of the year 1932, in which year this beetle probably caused greater destruction of fruit and produce crops than at any time since its discovery in the United States in 1916.

The spread of Dutch elm disease by elm cambium beetles and the control of this insect in practice [trans. title], J. J. FRANSEN (*Tijdschr. Plantenziekten*, 37 (1931), No. 9, pp. 169-187, pls. 3; *abs. in Rev. Appl. Ent.*, 20 (1932), Ser. A, No. 1, p. 4).—An account of the spread of *Graphium ulmi* by *Scolytus scolytus* F., together with natural and artificial measures of control. The braconid *Coeloides scolyticida* Wesm. is an important enemy, parasitism by it sometimes reaching 100 percent. An account of the discovery of this disease in the United States in 1930 by May and Liming in Ohio has been noted (*E.S.R.*, 65, p. 448).

White-pine weevil attack on Scotch pine, H. J. MACALONEY and J. W. JOHNSTON (*Jour. Forestry*, 31 (1933), No. 1, pp. 26-28).—This brief account includes tables giving (1) the relative amount of attack and the number of leaders actually killed compared with the total number of trees examined and (2) the severity of attack and the number of dead leaders in four plats at Harvard Forest, Petersham, Mass.

Relation of temperature to the development of the plum curculio in apples, W. D. WHITCOMB (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 415-419).—Contributing from the Massachusetts Experiment Station, the author points

out that the rate of development of the immature stages of the plum curculio increases with each increase in temperature above 55° F.

"The number of punctures by adults in unsprayed apples also increases with the temperature, but less rapidly than the number of eggs deposited. When confined with apples sprayed with lead arsenate, the number of days which the beetles live and the number of punctures which they make before death decreases with each increase in temperature and each increase in the concentration of lead arsenate. By applying sprays or dusts just before the first period of high temperatures following the petal fall stage, fruit growers have decreased injury by this insect 11 to 20 percent, compared to less timely applications."

Further studies on the control of the apple curculio in the Champlain Valley, O. H. HAMMER (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 420-424, fig. 1).—This is a report of additional life history studies (E.S.R., 67, p. 719) of the apple curculio by the New York State Experiment Station. In the experimental plats partial control was again secured by properly timed heavy applications of lead arsenate sprays.

House ants, T. J. HEADLEE (*New Jersey Stas. Circ.* 265 (1933), pp. 3).—A brief practical account.

Further information on chlorine sterilization of beekeeping equipment, H. G. AHRENS and M. C. TANQUARY (*Amer. Bee Jour.*, 72 (1932), No. 1, pp. 12-14, 33, 34, figs. 6; *abs. in Minnesota Sta. Rpt.* 1932, pp. 35, 36).—A method for sterilizing beekeeping equipment by chlorine as developed at the station is described.

The biology of *Encyrtus infidus* Rossi, a parasite of *Lecanium kunoensis* Kuw. (Hymen.), C. P. CLAUSEN (*Ann. Ent. Soc. Amer.*, 25 (1932), No. 4, pp. 670-687, pl. 1).—The author has found *E. infidus* to be parasitic in *L. kunoensis* in central Chosen (Korea), where it produces two generations and a partial third each year upon the one host generation. "The gross parasitization effected in the field approximates 100 percent, yet control is not effected, owing to the fact that the host females are able to deposit approximately half of their quota of eggs before death. . . . In the spring generation pupation takes place within the unbroken larval skin in the living host. The death of the host results from mechanical injury at the time of emergence of the first parasite, rather than as a direct result of the feeding of the parasite larvae upon the body contents."

Notes on breeding *Macrocentrus ancyliivorus* from reared hosts, P. GARMAN (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 330-334).—This is a discussion of the methods found most efficient in the rearing of *M. ancyliivorus*, an important parasite of the oriental fruit moth.

A new parasite of *Laspeyresia molesta* Busck, T. UCHIDA (*Jour. Wash. Acad. Sci.*, 23 (1933), No. 3, pp. 147, 148, fig. 1).—Under the name *Diocetes molestae* the author describes a new ichneumonid parasite reared from the oriental fruit moth in Japan.

Methods of breeding *Trichogramma* in Connecticut, J. C. SCHREAD (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 402-404, pl. 1).—A discussion of the methods employed at the Connecticut State Experiment Station in the large-scale rearing of the egg parasite *T. minutum*.

Contribution to the study of the parasites and hyperparasites of *Hypnomenota malinellus* Zell. [trans. title], P. VOUKASSOVITCH (*Rev. Zool. Agr. et Appl.*, 31 (1932), Nos. 7, pp. 108-120, pl. 1, figs. 6; 8, pp. 124-136, figs. 3; 9, pp. 137-145, figs. 4; 10, pp. 153-160, pl. 1, fig. 1; 11, pp. 174-183, figs. 4).—The parasites of the ermine moth noted include *Herpestomus brunneicornis* Grav., *Angitia armillata* Grav., *Pimpla examiner* F., *P. maculator* F., *Agrypon*

anxium Wesm., *Brachymeria* (*Chalcis*) *minuta* L., *Ageniaspis fuscicollis* Dalm., *Tetrastichus crassinervis* Thoms., *Discochaeta cognata* Schin., and *Agria mamillata* Pond. Seven species of hyperparasites are noted.

Hymenopterous parasites from the eggs of aquatic and semi-aquatic insects, C. H. HOFFMANN (*Jour. Kans. Ent. Soc.*, 5 (1932), No. 2, pp. 33-37).—A brief summary of the literature presented in connection with 34 references.

Miscellaneous descriptions and notes on parasitic Hymenoptera, A. B. GAHAN (*Ann. Ent. Soc. Amer.*, 25 (1932), No. 4, pp. 736-757).—Descriptions of 11 species and 1 variety of hymenopterous parasites, representing 8 families, as new are accompanied by synonymical and distributional notes.

A parasitic hymenopteron as a vector of an insect disease, N. M. PAYNE (*Ent. News*, 44 (1933), No. 1, p. 22).—Mention is made of the transmission of a sporozoan disease of the larvae of the Mediterranean flour moth due to *Thelohania ephestiae* Mattes by the braconid *Microbracon hebetor* Say.

Experiments on the control of mites infesting raspberries, R. HUTSON (*Jour. Econ. Ent.*, 26 (1933), No. 2, pp. 425-430).—Contributing from the Michigan Experiment Station, the author considers the nature of the damage, the distribution, and loss sustained from mites, particularly *Tetranychus mcdanieli* McG., on raspberries in that State, together with control measures.

A series of three sprays of summer oil at 1 percent strength reduced the mite population to an extremely low figure in May 1931, while an identical series of sprays applied just after the leaves came out in 1932 protected raspberries from damage by mites. Raspberry foliage is apparently entirely tolerant to sprays of 1 percent summer oils.

The Rocky Mountain wood tick, R. A. COOLEY (*Montana Sta. Bul.* 268 (1932), pp. 58, pl. 1, figs. 14).—This account of the Rocky Mountain spotted fever tick, known both as *Dermacentor venustus* Banks and *D. andersoni* Stiles, following an introduction, deals with other ticks liable to be mistaken for it, including the winter tick, American dog tick, rabbit tick, and several species of less importance in Montana; the responsibility of the spotted fever tick in human diseases and in diseases of domestic animals; life history; conditions favoring its abundance; the tick season; habits of unfed adult ticks in nature; and geographical distribution. Its adaptations are then taken up and followed by descriptions of dressings used to avoid ticks, tick bites, removal of the attached tick, fear of ticks, experiences in the control of the tick, other methods of control, general considerations in control, and tick parasites. A list of 37 references to the literature is included.

Results of an investigation concerning the timbers of the Netherland East Indies which are resistant against Teredo [trans. title], J. W. GONGGRIJP (GONGGRYP) (*Dept. Landb., Nijv. en Handel Nederland Indië, Meded. Boschbouwproefsta.*, No. 25 (1932), pp. 1-99, pls. 12; *Eng. abs.*, pp. 85-87).—This account is said to be a continuation and extension of an investigation commenced in Surinam with a view to discovering new timbers resistant against *Teredo* and to test the correctness of the hypothesis that a certain content of silica particles renders timbers possessing a certain degree of firmness immune against attack. It includes a description of the anatomy of *Teredo* and a summary of the 12 subgenera into which the species of the genus are separated.

Further results of investigations about the resistance of Netherland East Indian timbers against the attack by Teredo and other marine borers [trans. title], A. T. J. BIANCHI (*Dept. Landb., Nijv. en Handel Nederland Indië, Meded. Boschbouwproefsta.*, No. 25 (1932), pp. 101-147; *Eng. abs.*, pp. 130-132).—This second contribution (see above) consists of a compilation of information obtained from various sources on the resistance of timbers of the Netherland East Indies to attack by marine borers.

Nuttallia minor n. sp., new blood parasite of horses [trans. title], D. N. ZASUKHIN (SASSUCHIN) (*Vest. Mikrobiol., Épidemiol. i Parazitol. (Rev. Microbiol., Épidémiol. et Parasitol.)*, 11 (1932), No. 3, pp. 181-185, pl. 1, fig. 1; *Eng. abs.*, p. 185).—A description is given of a new piroplasm (*N. minor*) found in blood films from 107 horses attacked by a disease the etiology of which has not been worked out. Mention is made of three ticks suspected of transmitting the parasite.

Some notes on the temperature regulation of normal susliks, *Citellus pygmaeus* Pallas [trans. title], IŮ. RALL (G. RALL) (*Vest. Mikrobiol. Épidemiol. i Parazitol. (Rev. Microbiol., Épidémiol. et Parasitol.)*, 11 (1932), No. 3, pp. 197-207, figs. 3; *Eng. abs.*, pp. 206, 207).—The author concludes that the heat regulation of normal susliks, *C. pygmaeus*, is abated and their body temperature follows rather flexibly that of the surroundings.

ANIMAL PRODUCTION

[Livestock investigations in Florida] (*Florida Sta. Rpt. 1932*, pp. 49, 50, 51, 52, 53, 54, 55, 56, 57).—Results are reported dealing with the use of species of *Crotalaria* as forage crops and hay for rabbits, by G. E. Ritchey, and for cattle, by R. B. Becker; adaptability of various pasture grasses to the peat and muck soils of the Everglades, by A. Daane and R. W. Kidder. Other tests dealt with the wintering of steers on peanut hay alone and the comparative value of Bermuda, Bahia, Dallis, centipede, and carpet grasses for fattening beef cattle, by A. L. Shealy, and the use by Becker of an iron-copper-salt mixture for cattle and swine.

Comparison was made of dry lot feeding and grazing on Spanish peanuts, corns, chufas, and sweetpotatoes, alone and in combination, and runner peanuts and runner peanuts and oats for fattening fall pigs, by Shealy.

Data are given on tests of the effect of various vermifuges on egg production, as well as the toxicity and palatability of *Crotalaria* seed on chickens and quail, by E. F. Thomas.

[Livestock investigations in Georgia] (*Georgia Sta. Rpt. 1932*, pp. 27, 28, 29, 30, 32, 33).—Data are reported from a comparison of tankage and tankage and cottonseed meal in equal parts with tankage and peanut meal in equal parts as protein supplements to shelled corn for swine; preliminary tests of the value of menhaden oil for swine; a test with fattening beef cattle in which alfalfa, cowpea, and peanut hays and cottonseed hulls were fed as a supplement to a concentrate ration; and of the results when green oats and corn were ensiled in a trench silo without chopping.

[Investigations with livestock] (*Kansas Sta. Bien. Rpt. 1931-32*, pp. 55-63, 74-81, 108, 109, 110, 121, 124).—Data obtained in studies with pigs are reported on the nutritive requirements of swine, by C. E. Aubel, J. S. Hughes, and H. F. Lienhardt; swine-feeding investigations, by Aubel and W. E. Connell; and alfalfa pasture for swine at the Garden City Substation.

The beef cattle studies have yielded information on the use of silage for fattening beef cattle, by A. D. Weber and Connell; the comparative nutritive value of dry matter in sorgo silage and fodder, by Weber; methods of utilizing native pasture in beef cattle feeding and a study of pasture values and pasture methods for livestock, by C. W. McCampbell; the influence of feed on the color, chemical composition, and cooking quality of the meat of grass-fat cattle, by McCampbell et al.; the antagonism of monovalent and polyvalent metals in the lipin fraction of beef, by H. H. King and J. L. Hall; and beef cattle feeding investigations at the Fort Hays Substation.

The poultry studies report data on poultry flock management; the comparative nutritive value of certain grain sorghums, corn, and wheat in poultry production; and the inheritance of slipped tendons, all by L. F. Payne; the effect of age and holding temperatures on the hatchability of turkey and chicken eggs; the temperature requirement of incubating turkey eggs; a comparison of the confinement and semiconfinement rotation systems of growing turkeys as measured by growth and mortality; the rate of growth and mortality of young turkeys as influenced by the ingestion of fibrous material; the effect of age of breeding turkeys on percentage production, distribution of production, egg size, and hatchability; and the value of tobacco powder in the prevention of enterohepatitis in turkeys, all by H. M. Scott; the effect of feeding a vitamin A low ration to growing poults; the effect of the lack of vitamin D on growing poults; the effect of feeding a vitamin A low ration to maturing Bronze turkey pullets and Single Comb White Leghorn hens; a quantitative study of the vitamin A requirement for growing poults; and a study of the rate of growth and embryonic development of Bronze turkey embryos, all by Scott and Hughes; the etiological factors involved in the malformation of bones in young chickens, by Payne, Hughes, Lienhardt, and L. D. Bushnell; and the relation of adequacy of diet to disease, by Hughes, C. A. Brandly, and Payne.

Results are also reported on comparison of Hampshire, Shropshire, Dorset, and Southdown sheep for wool, and of various rations for fattening range lambs, by R. F. Cox.

[Experiments with livestock in New Mexico] (*New Mexico Sta. Rpt. 1932, pp. 28-33, 81-84, fig. 1*).—Preliminary results of studies with cattle include data on mineral feeding of range cattle as it affects calf crop and rate of gain, digestibility and mineral balances when native New Mexico mixed range grasses are fed and digestibility and mineral balances when mineral supplements are added, and steer feeding experiment, 1931-32. The work with sheep included a study on the feeding of whole corn plant as ground fodder and as silage for fattening lambs. The poultry studies report data on poultry breeding and feeding.

Investigations into the intensive system of grassland management, IV-XI (*Jour. Agr. Sci. [England], 21 (1931), No. 3, pp. 414-424, fig. 1; 425-441, figs. 2; 452-457, 469-475; 22 (1932), No. 2, pp. 235-290, figs. 5*).—This series of studies (E.S.R., 67, p. 297) has been continued.

IV. *The digestibility and feeding value of artificially dried grass*, S. J. Watson (pp. 414-424).—Digestion trials with sheep were conducted to obtain information as to the digestibility and feeding value of artificially dried grass. The grass used was obtained from an area that had been intensively treated and which had received a dressing of nitrogen four weeks prior to the date of cutting. The grass was dried in an experimental band drier. A portion of the grass was fed as it came from the drier, while another portion was ground into a meal. A feeding trial was also undertaken with dairy cows to determine the feeding value of such grass.

With sheep the digestibility of the two samples of grass was high, and with the exception of crude protein was equal to values quoted for short grass. In both cases the sheep gained in weight, and there was also a retention of nitrogen and mineral matter. The grass appeared to contain sufficient calcium, phosphorus, and potash for the plane of nutrition at which it was fed. The high digestibility of the crude protein and the narrow nutritive ratio of dried grass and grass meal proved that the material was superior to hay of excellent quality. This was true in spite of the fact that the grass was cut in August when the protein content was lower than might normally be expected.

The trial with dairy cows showed that artificially dried grass was readily eaten and produced the amount of milk for which the nutrients it supplied were theoretically capable.

V. *The digestibility and feeding value of grass silage made in a tower, and the digestibility and comparative yield of artificially dried grass obtained from the same source*, S. J. Watson (pp. 425-441).—Grass from a field of permanent grass which had reached a stage when it might have been cut for early hay and in which there was little clover was placed in a silo. Samples of grass in sacks were put in the silo at varying levels, and a drain was constructed at the bottom of the silo so that the loss by drainage could be determined. The digestibility of the silage was determined in trials with sheep, and its value under practical conditions was determined by feeding to dairy cows.

The loss by drainage was negligible, while at the same time fermentation losses were not high. The silage produced was a highly nutritious feeding stuff. The dairy cows ate the silage readily, and their milk production was not affected when the silage replaced all of the hay in the maintenance ration. The amounts of starch equivalent and digestible crude protein were somewhat higher in artificially dried grass than in grass silage, while the digestible true protein was considerably lower in the silage. However, it should be remembered that in general practice grass silage would be substituted for ordinary hay and not for artificially dried grass.

VI *The digestibility and feeding value of grass silage made in a stack*, S. J. Watson (pp. 452-457).—Grass silage was made in stacks from aftermath grass from an old grassland which had received basic slag and potash for the hay and nitrogen for both hay and aftermath. The silage was made in stacks 15 ft. in diameter. Digestibility trials with sheep were carried out on two samples of this silage.

The digestibility of the crude fiber of the silage was quite high, and in addition the fiber content was low. In digestibility of other constituents the two samples of silage compared favorably with other silages. However, there was evidence of a depressive effect on the digestibility of the crude protein as compared with meadow hay. It is concluded that making stack silage was a useful method of conserving surplus grass, particularly of the aftermath type, when good haying weather was lacking. No feeding trials were conducted, but the silage was fed to stock with satisfactory results.

VII. *The digestibility and feeding value of grass silage made in a pit*, S. J. Watson (pp. 469-475).—Grass which had reached the flowering stage, having grown beyond the optimum stage for hay making, was made into silage in a concrete pit. The grass used was of poor quality, and as a result the fiber content of the silage was high and the crude protein and ash low. The digestibility of the silage was determined in trials with sheep.

The digestibility of all the constituents compared favorably with meadow hay except that of protein, which showed a depression. The starch equivalent of this silage was higher than that of meadow hay when compared on a dry-matter basis. It was also equal in digestible protein content to poor-quality meadow hay. The silage was eaten readily by dairy cows on pasture within 4 weeks after being made.

VIII. *The comparative digestibility and feeding value of fresh and artificially dried grass*, S. J. Watson and W. S. Ferguson (pp. 235-246).—A series of two tests was undertaken to compare the digestibility of fresh grass and that of grass cut at the same time and from the same source but dried in a band drier heated by air at an inlet temperature of either 200° or 600° C.

With the exception of crude protein, which was slightly depressed, there was no difference in the digestibility of the various constituents at the 200° inlet

temperature. However, at the higher temperature there was a depression in the digestibility of all the nutrients, especially of the protein where the effect was very marked. These results indicated that while the use of the higher initial temperature increased the output of the drier it adversely affected the digestibility of the final product.

IX. *The digestibility of artificially dried hay*, S. J. Watson and W. S. Ferguson (pp. 247-250).—In this test a mixture of clover and ryegrass was cut when from 9 to 12 in. in length and was stacked while green around a conical-shaped tower of pipe through which water was circulated at an average temperature of from 100° to 110° F. for 45 hours. The finished hay was of excellent quality and high digestibility. It had a higher feeding value than good meadow hay or seeds hay and was made at a season when haying conditions were poor. No attempt was made to determine the economics of this practice.

X. *A further study of the mineral content of intensively treated pasture*, W. S. Ferguson (pp. 251-256).—The results published in this paper are in amplification of and include a more complete mineral analysis of samples used in an earlier study (E.S.R., 67, p. 297). In addition to the more common mineral elements, determinations were made for magnesium, manganese, iron, sulfur, and chlorine.

It was shown that the mineral content of intensive pastures was equal to that of the best type of pasture produced by other systems of management and superior to the average good cultivated pasture. Seasonal variations in soluble ash, potash, soda, and phosphoric acid depended principally upon climatic conditions. Drought in one case lowered the percentages of soluble ash, potash, and phosphoric acid. Correlations were found to exist between the nitrogen and phosphoric acid content and between the soluble ash and potash content, but there was no evidence of correlation between other constituents.

XI. *The effect of nitrogen on the yield, composition, and digestibility of grassland herbage*, S. J. Watson, J. Procter, and W. S. Ferguson (pp. 257-290).—Over a 2-year period tests were carried out to determine the effects of nitrogenous fertilizers, used in combination with rotational grazing on grass adequately supplied with potash, phosphates, and calcium. The effects were to a large extent governed by climatic conditions, and in the absence of sufficient moisture the increase in amount of herbage was reduced.

The average effects of nitrogen were to produce grass at an earlier date than normal and to increase the total yield of dry matter and crude protein per acre. Nitrogen caused a more uniform growth throughout the growing season and accelerated recovery after the midseason depression of growth. Where nitrogen was used autumnal growth was maintained at a higher level than on nontreated grass. The protein content of nitrogen-treated grass was increased, particularly at the most critical periods when the percentage in the nonnitrogen-treated grass fell to a very low level. The herbage on nitrogen-treated pastures had a high digestibility throughout the season.

The vitamin A content of alfalfa as affected by exposure to sunshine in the curing process, M. C. SMITH and I. A. BRIGGS (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 3, pp. 229-234).—Using the method of Sherman and Munsell (E.S.R., 54, p. 89), the Arizona Experiment Station measured the comparative destructive effect of curing periods of different length on the vitamin A content of alfalfa produced under Arizona conditions. The Hairy Peruvian variety of the third cutting from a planting in its second crop-year was cut when about 22 in. high. The cutting was done at 11.15 a.m., and one sample was taken immediately to a darkened curing house. The rest of the hay was spread in a swath so that the individual plants were separated, and samples were removed after being exposed for 2.8, 4.8, 6.8, 20.8 and 24.8 hours.

The vitamin A content of samples spread out in a field for 2.8 hours was from 20 to 33 percent less than that of the sample cured in the dark. No increased loss was found when the period of exposure was increased to 6.8 hours the same day, and there was no observed loss of green color in the leaves. Hay allowed to lie in the field until 8 a.m. the morning after cutting showed a loss of 75 percent in the vitamin A content, which was increased to 84 percent by a further 4-hour exposure when compared to the sample cured in the dark. The leaves of hay exposed for long periods retained a large part of their green color, but the stems showed evidence of marked bleaching. Alfalfa severely bleached by 1-week exposure to sun and rain in the swath had only 4 percent of the vitamin A present in the sample cured in the dark.

The antirachitic value of alfalfa as affected by exposure to sunshine in the curing process, M. C. SMITH and I. A. BRIGGS (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 3, pp. 235-240).—Three samples of hay, prepared as described in the preceding paper, were compared for their antirachitic properties. One sample was cured in the dark, the second sample was allowed to lie in the field from 11.15 a.m. one day to 12 m. the next day, during which time it received 15 hours 15 minutes exposure to sunlight of varying intensity, while the third sample lay in the swath for one week and received 57.3 hours of sunshine and during that time there was a precipitation of 0.37 in. of rain. The antirachitic potency was determined by the "line test" on rats.

Prolonged feeding of alfalfa cured in the dark did not alleviate induced rickets in the experimental animals, the second sample of hay possessed mild calcifying powers, while the third sample was highly antirachitic. The practicability of increasing the vitamin D content of alfalfa by prolonged exposure to sunlight is discussed, but the practice is not recommended because of the destruction of vitamin A and the weather damage to the hay.

The digestibility and feeding value of dreg meal, S. J. WATSON, (*Jour. Agr. Sci. [England]*, 21 (1931), No. 3, pp. 410-413).—Digestion trials were conducted with two lots of two sheep each to determine a true measure of the feeding value of dreg meal, a dried by-product of the production of alcohol. One lot received a ration of artificially dried hay and the other lot a ration of the same hay plus dreg meal.

This meal was found to be similar in feeding value to linseed cake. The meal proved to be a valuable feedstuff of high digestibility and feeding value and was suitable for feeding cattle and hogs as well as sheep. Because of its high oil content care should be taken in feeding the meal.

Mineral feeds, J. R. HAAG (*Oregon Sta. Bul.* 309 (1933), pp. 12).—The mineral salts and elements essential to normal growth and reproduction are pointed out, their importance described, and their occurrence in feeds explained. The calcium and phosphorus contents of some feedstuffs and of calcium and phosphorus supplements are given in tabular form. When and how to use mineral supplements in animal feeding is explained. A section is devoted to proprietary mineral mixtures, pointing out that they should be judged by the value of their useful ingredients.

The relation of body shape of feeder steers to rate of gain, to dressing per cent, and to value of dressed carcass, J. L. LUSH (*Texas Sta. Bul.* 471 (1932), pp. 30, figs. 5).—This study is based on measurements, made in a study previously noted (E.S.R., 60, p. 254), with an extension of the data to include 25 lots of 241 steers which were fed at the Spur Substation from 1922 to 1929. Simple and multiple correlations and score cards, made up from the standard regression coefficients to show the importance of the relation of groups of variables to rate of gain, dressing percentage, and value of the dressed carcass, are presented.

The data show a tendency for initial weight to be positively associated with gains, dressing percentages, and final values of the steers, but when the measurements were taken into consideration initial weight became of less importance. The highest dressing percentages and the most valuable meat at the end of the feeding period were obtained from steers with large fleshy measurements but small body measurements as calculated from the regression coefficients. Much variability was noted in the relationship, so that predictions could not be very accurately made from the conformation of the feeder steer. The factors most closely associated with dressing percentage and meat value were large heart girth with a shallow chest, large loin and large flank girth, large initial weight, small paunch girth, narrow head at the eyes, and short height over hips. Gains were associated with length of body and height at withers, paunch girth, flank girth, and width at loin. The data indicate that no plan based on conformation of the feeder steers could ever estimate future performance without many mistakes. Much variability was shown in the relationship of the shape of steers to the gains made.

The glyceride structure of beef tallows, A. BANKS and T. P. HILDITCH (*Biochem. Jour.*, 25 (1931), No. 4, pp. 1168-1182, fig. 1).—An analysis was made of one sample of North American beef tallow and three samples of tallow from South America at the University of Liverpool to determine the content of fully saturated glycerides, the fatty acids which go to make up these glycerides, and also those of the whole fats.

In the whole fats the combined molecular percentage of stearic, oleic, and linoleic acids tended toward one of two definite figures in spite of wide variations in the amount of stearic and a corresponding variation of oleic with linoleic acid. The proportion of fully saturated glycerides present varied according to the relative amount of saturated and unsaturated acids in the whole fat. However, the composition of the acids was about 60 percent palmitic (with myristic) and 40 percent of stearic acid in all cases.

This regularity in structure is discussed in regard to the possible connection in the elaboration of storage fat in the animal.

Fattening range lambs in Idaho, E. F. RINEHART, C. W. HICKMAN, and R. F. JOHNSON (*Idaho Sta. Bul.* 194 (1932), pp. 48, figs. 10).—Concluding a series of studies (E.S.R., 66, p. 257) that have been conducted for a number of years at the Aberdeen and Caldwell Substations, it was found that quality of feeds, regularity of feeding, adequate watering facilities, and dry, comfortable lots, all added to the rapidity and economy of gains. When properly handled, lambs pastured on aftermath of hay fields, grain stubble, and beet tops gained from 10 to 15 lb. additional weight.

There was no material difference in the relative value of barley, corn, and wheat, but oats, while excellent to start lambs on grain, tended to produce growth. Cottonseed meal and linseed meal fed with barley and alfalfa increased the rate of gain, reduced the grain and hay requirements, and increased the market value of the lambs. Cull beans could replace about 20 percent of the barley satisfactorily, but larger quantities caused digestive disturbances. Cull peas, when replacing 20 percent of the barley, were a valuable supplement to barley and alfalfa, but when replacing only 10 percent did not make a favorable showing. Recleaned, heavy alfalfa seed screenings, when used to replace one third of the barley, were a valuable supplement.

Beet pulp whether stored wet, pressed, or fed fresh, was a valuable supplementary feed to alfalfa and barley, helped to keep the lambs on feed, and reduced the cost of gains. Cull potatoes, fed at the rate of 1 lb. per head daily, were found to be a useful feed, but cooking potatoes did not prove profitable.

Corn silage, when fed at the rate of 1 lb. per head daily, did not materially affect gains or feed requirements, but made a significant saving in alfalfa and increased the gains slightly when fed at the rate of 2 lb. per head daily. Corn silage was also valuable for maintaining thrift and keeping the lambs on feed. Chopping and grinding alfalfa had no significant effect on the rapidity or economy of gains but did effect a saving of hay. Alfalfa and clover chaff, being fibrous roughages, were not adapted to lamb-fattening rations.

Small lambs were as economical to feed as average-sized lambs, provided they were fed separately. The small lambs required a longer feeding period than the larger ones. In one year's test shearing lambs 35 days before marketing did not prove profitable. The shrinkage of lambs to market varied considerably, depending on home weighing conditions, finish of the lambs, proportion of grain and roughage, nature of the ship, comfort of the lambs in the car, condition of the feed yards en route, and the fill on the market.

Green soybeans, alfalfa, and permanent pasture as forages for fattening hogs, E. G. GODBEY, E. D. KYZER, and T. M. CLYBURN (*South Carolina Sta. Bul.* 289 (1933), pp. 16, figs. 2).—The results of two tests at Clemson College and two tests at the Coast Substation are reported, dealing with the comparative value of green soybean pasture with and without supplements of corn and fish meal and comparisons of the soybean pasture with alfalfa and permanent pasture.

There were 10 pigs in each lot, averaging at the start of the test from about 40 to 50 lb. The average results of the four tests showed that during the period of feeding to 200 lb. live weight the pigs in dry lot on corn and fish meal free choice made average daily gains of 1.4 lb., consuming 323 lb. of corn and 36 lb. of fish meal per 100 lb. of gain. When these feeds were fed free choice with green Biloxi soybean pasture the average daily gains were 1.59 lb., the pigs consuming 304 lb. of corn and 20 lb. of fish meal per 100 lb. of gain. Similar results were obtained with free-choice feeding of these feeds on green Ootootan soybeans. On alfalfa pasture and on permanent pasture the results obtained with free-choice corn and fish meal were as follows: 1.41 and 1.38 lb. average daily gains with 329 lb. of corn and 23 lb. of fish meal consumed per 100 lb. of gain in the former lot and 323 lb. of corn and 28 lb. of fish meal consumed in the latter lot. Gains of only 1.25 lb. per head daily were produced when corn alone was full-fed on green soybean pasture, and the consumption of corn was 349 lb. per 100 lb. of gain. Limiting the ration of corn to 2.5 percent on green soybeans reduced the gains to 0.96 lb. daily with a feed consumption of 282 lb. per 100 lb. of gain. When one part of fish meal was added to 15 parts of corn in the 2.5 percent limited ration on green soybeans, gains of 1.04 lb. daily were made, with a feed consumption of 258 lb. of corn and 18 lb. of fish meal per 100 lb. of gain. Limiting the corn and fish meal to 2.5 percent until the pigs reached 100 lb. live weight and finishing on corn and fish meal free choice with green soybean pasture throughout the test produced gains of 1.37 lb. at a feed consumption of 294 lb. of corn and 18 lb. of fish meal per 100 lb. of gain.

It is concluded from the test that the hogs fed corn and fish meal free choice with the soybean pasture made faster and cheaper gains than where the rations were limited, but the gains were less expensive where the corn and fish meal were limited during the first part of the fattening period. Both alfalfa and permanent pasture seemed to be of less value for fattening hogs than the soybeans. A large percentage of soft and oily carcasses were produced on the rations limited to 2.5 percent of corn or 2.5 percent of corn and fish meal with the soybean pasture. A large percentage of the carcasses produced in the other lots were satisfactory.

The mineral requirements of pregnant sows, R. E. EVANS (*Jour. Min. Agr. [Gt. Brit.]*, 39 (1932), No. 6, pp. 544-548).—Metabolism studies with pregnant sows were conducted at the Animal Nutrition Institute, University of Cambridge, to determine their mineral requirements. Two groups of sows received a balanced ration of barley meal, maize meal, bean meal, and blood meal, with 0.5 lb. of salt added to 100 lb. of mixed feed. Lot 1 received the basal ration only, while lot 2 received in addition about 1 oz. of ground limestone daily.

During the 115-day gestation period the sows in lot 1 retained an average of 38 g of lime, 646 g of phosphate, 110 g of potash, and 383 g of salt. The corresponding figures in lot 2 were 1,314, 720, 201, and 288 g, respectively. It was evident that the greatest deficiency in the basal diet was in the lime content. The animals in this group had to supply this necessary element by depletion of their own skeletons.

It is concluded that a suitable mineral mixture for pregnant sows not on pasture should consist of four parts of chalk to one part of common salt to be fed at the rate of 1 oz. per head daily. During the lactation period it is recommended that 2.5 oz. of this mineral mixture be fed daily.

Horse feeding, W. C. SKELLEY (*New Jersey Stas. Circ.* 268 (1933), pp. 4).—Practical directions are given for feeding horses under different conditions of work. The requirements of a satisfactory ration are discussed, and a table is given showing the average digestible nutrients in some of the common feeding stuffs.

Growth and chemical composition of ovum of functioning fowl's ovary (*Gallus domesticus*), A. L. ROMANOFF (*Biochem. Jour.*, 25 (1931), No. 4, pp. 994-996).—The New York Cornell Experiment Station undertook a study of the storage of chemical elements in the ova during the early growth period as well as during maturation. The ova used were from White Leghorn hens of known history.

It was found that during the growth phases and particularly during the maturation phase the ovum increased rapidly in percentage of dry matter, reaching the highest point in a mature ovum. The calcium and fat content increased proportionately with the advance of maturation. The density and hydrogen-ion concentration, iodine number, and refractive index of the extracted fat changed but slightly during the maturation phase.

The effect of current interruption in electrical incubation, L. W. TAYLOR, C. A. GUNNS, and B. D. MOSES (*California Sta. Bul.* 550 (1933), pp. 19, figs. 3).—This study was planned to determine some of the specific effects of prolonged failure in the heat supply during electrical incubation on the hatchability of hen's eggs. The check lots of White Leghorn eggs received uninterrupted incubation at temperatures of from 101° to 102° F. for the first week, 102° to 103° for the second week, and 103° to 104° for the final week of incubation. The chilled lots were incubated under normal conditions except for several periods of 12 hours when the current was turned off. The room temperatures in the incubation room were maintained at 70°.

Under the conditions of this test current interruption produced an average decrease in the number of chicks hatched of 3.4 percent. The number of crippled and weak chicks produced by current interruption was approximately twice the number found with normal incubation conditions. While no critical day was found in which the developing embryo was particularly susceptible to chilling, current interruption during the second and third weeks of incubation brought about a greater mortality than that accompanying chilling during the first week. The increased loss due to chilling was expressed in an

increased proportion of deaths at the major peak points in the mortality curve. Since there was no specific type of embryonic mortality, it was apparent that the increased loss was of weak but normal-appearing embryos. The daughters of certain sires produced embryos that were susceptible to death from chilling, and the close relationship between some of these sires indicated that this susceptibility was a hereditary weakness.

Best age for the chick's first feed, A. C. SMITH (*Farmer*, 48 (1930), No. 18, p. 39; *abs. in Minnesota Sta. Rpt. 1932*, p. 33).—Studies were undertaken at the station to determine at what age chicks should first be fed. Comparable chicks were divided into lots and were fed 24, 36, 48, 60, and 72 hours after hatching.

The mortality rate at the end of 4 weeks was 18, 14, 10, 8, and 6 percent in the lots receiving feed after 72, 24, 36, 60, and 48 hours, respectively. At this time the average weight per chick was 143.2, 140.2, 133.1, 129.1, and 126 g in the lots first fed after 36, 48, 72, 24, and 60 hours. When all factors were considered it appeared that from 36 to 48 hours was the best time at which to give chicks their first feed, and the results also showed that there was a decided disadvantage in withholding feed for 72 hours.

Detection of washed, abraded, and oiled eggs, P. F. SHARP (*Indus. and Engin. Chem.*, 24 (1932), No. 8, pp. 941-946).—A method for detecting washed eggs is described in this article from the New York Cornell Experiment Station. The method is based on the observation that the material on the surface of the shell contains potassium and chloride which are removed by washing. Micro-precipitation tests of the shell extract from unwashed eggs gave tests for potassium and chloride, while the washed eggs did not give this reaction.

It was also found that oil treatment of eggs could be determined by dipping a portion of the shell in ethyl ether and observing the oily ring after the ether had evaporated. The sand-blast or scraping method of cleaning dirty eggs could be recognized by the absence of protein on the surface of the eggs as brought into prominence by staining.

The results of applying these tests to eggs of unknown history are presented.

Oiling does not make shell eggs more brittle, T. L. SWENSON and L. H. JAMES (*U.S. Egg and Poultry Mag.*, 38 (1932), No. 11, pp. 14-16, 58, figs. 2).—In studying the effect of oiling on the cracking strength of eggshells the U.S.D.A. Bureau of Chemistry and Soils used the following series of eggs: (1) Normal unoiled eggs, (2) eggs oiled by dipping in an open oil bath, and (3) vacuum-carbon dioxide oil-dipped eggs. The determination of cracking strength was made by calculating the striking force of a mass of known weight falling as a free body through a given distance and measured in dynes.

The results of the study showed that there was a positive association between the thickness of the eggshell and the force in dynes necessary to crack it. The effect of oiling upon the breaking strength was so slight that it might be disregarded.

Application of ultra-violet radiation in the poultry industry, K. M. REID (*Agr. Engin.*, 14 (1933), No. 1, pp. 13, 14, figs. 4).—This abstract of a paper presented before the American Society of Agricultural Engineers reviews studies at different institutions on the effect of ultraviolet radiation of poultry, indicating its utility in increasing egg production and fertility and in hastening the growth of chicks.

Water-fowl and game-birds in captivity: Some notes on habits and management, A. F. MOODY (*London: H. F. & G. Witherby*, 1932, pp. 240, pls. 6).—The notes here presented are based upon personal observations of waterfowl and game birds.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products] (*Kansas Sta. Bien. Rpt. 1931-32*, pp. 63-72, 121, 124, 125).—Data obtained in studies with dairy cattle are reported on milk as a sole diet for calves, the sugar and hemoglobin contents of the blood of dairy cattle, and the influence of the ration on the vitamin C content of cow's milk, all by H. W. Cave, W. H. Riddell, J. S. Hughes, C. H. Whitnah, and H. L. Lienhardt; a comparison of sorgo fodder and sorgo silage for milk and butterfat production, Atlas v. Kansas Orange sorgo silage for milk production, sorghum grains v. corn for developing dairy heifers, soybean v. alfalfa hay for milk and butterfat production, ground wheat v. ground corn for dairy cows, and silage weight determinations, all by J. B. Fitch and Cave; the influence of stage of maturity of sorgo silage on quality and composition, by Fitch, Cave, and W. L. Latshaw; dairy cattle pasturing investigations at the Fort Hays Substation; irrigated pastures for dairy cows at the Garden City Substation; and dairy herd improvement at the Colby Substation.

With dairy products information is reported on the use of fresh eggs in ice cream, investigations of chocolate ice cream, the use of vegetable stabilizers in ice cream, gelatin in sherbet mixes, the effect of pasteurization temperature on the bacteria flora of the ice cream mix, and testing ice cream mixes for butterfat, all by W. H. Martin and W. J. Caulfield; a bacteriological study of ice cream, by A. C. Fay; a study of the effectiveness of lye as compared with chlorine for sterilizing milking machine parts, by Caulfield and Riddell; and butter investigations, by Martin.

Soybeans for silage, R. B. BECKER, W. M. NEAL, C. R. DAWSON, and P. T. D. ARNOLD (*Florida Sta. Bul. 255 (1932)*, pp. 24, figs. 3).—Data are presented on the use of soybeans for silage and the comparative composition of soybean hay and soybean silage, supplemented with the results of a double reversal test in which soybean silage was compared with alfalfa hay for milk production. In 3 years' work it was found that more protein and mineral matter and less total digestible nutrients were produced per acre with soybeans than with corn used as the silage crop, and that silage was a more efficient conserver of the nutrients in the soybeans than hay. In three double reversal tests comparing alfalfa hay with soybean silage, the average results showed that when fed with corn silage and mixed grain a slightly larger amount of milk and butterfat were produced on the alfalfa hay rations. It was calculated that 2.93 lb. of soybean silage was equivalent to 1 lb. of alfalfa hay. No objectionable flavors or odors were noted in the milk as a result of the soybean silage feeding. Variations in the mineral content of the soybeans were associated with the rainfall. Additional calcium and phosphorus in the form of bone meal were consumed by the cows on the legume rations.

Soybean silage for dairy cows, R. B. BECKER (*Florida Sta. Rpt. 1932*, pp. 52, 53).—Silage from Biloxi soybeans was compared with alfalfa hay for milk production.

Investigations with roots as a feed for dairy cows [trans. title], H. W. ESKEDAL and V. STEENBERG (*Beret. Forsøgslab. K. Vet. og Landbohøjskoles [Denmark]*, 144 (1932), pp. [4]+112, figs. 21; *Eng. abs.*, pp. 102-105).—The animal husbandry division of the Royal Veterinary and Agricultural College's research laboratory conducted a series of feeding tests with dairy cows during the period 1927-31 to determine the feeding value of roots, marrow stem kale, and artificially dried and pressed feed cakes.

The results indicated that 1.1 kg of dry matter in roots could be considered equal to 1 F.E. (feed unit of about 1.66 therms) when approximately 40 kg of roots were fed per head daily. The amount of roots fed and the percentage of dry matter in the ration influenced the quantity of milk produced. An average of 1.3 kg of dry matter in marrow stem kale was equal to 1 F.E. Artificial drying and pressing did not appear to change the feeding value of the products tested, namely, oil cakes, dried offal products, dried sugarbeet pulp, and dried brewers' grains, but did improve their keeping quality and ease of handling.

Report of an experiment to determine the effect of a low calcium ration on reproduction in cattle, C. P. FITCH, W. L. BOYD, C. H. ECKLES, T. W. GULLICKSON, L. S. PALMER, and C. KENNEDY (*Cornell Vet.*, 22 (1932), No. 2, pp. 156-172; *abs. in Minnesota Sta. Rpt. 1932*, p. 31).—A group of seven dairy cows was maintained for a period of about three years on a ration containing approximately 0.18 percent of dry matter calcium, with other necessary food elements supplied, without any lessening of breeding efficiency. Two other groups of seven animals each were maintained on rations having calcium contents of 0.32 and 0.64 percent calcium, respectively, on a dry matter basis, and they also showed normal breeding efficiency. Essentially the same reproduction results were obtained with parallel groups of rats on low, medium, and high calcium rations.

The calcium content of the ration had no appreciable effect on the total calcium content of the blood plasma of the cows during the experiment, nor were there any changes in milk or fat production that could be attributed to the calcium level of the ration. The effects of the ration on the composition and properties of the milk were negligible. Balance trials indicated that the animals were able to adjust themselves to the calcium content of the ration and to conserve the quantity ingested when the supply was limited.

Influence of arsenical dipping on yield of milk by dairy cows, P. T. D. ARNOLD, W. M. NEAL, and R. B. BECKER (*Jour. Dairy Sci.*, 15 (1932), No. 5, pp. 407-412).—In an effort to show the insignificant effect of arsenical dipping used in tick eradication work on milk yields, the Florida Experiment Station maintained records on the station herd during a campaign to eliminate ticks. The cows were dipped in a standard arsenical solution at 14-day intervals from March 1930 to May 1931, except during the months of January, February, and March when 28-day intervals were allowed.

On the basis of 826 cow dips there was a total shrinkage in milk flow of only 1.9 percent, comparing succeeding with previous week's milk yield. The greatest decrease in production was in the second milking after dipping, indicating that the effect was due to arsenic absorption rather than to the shock and excitement of dipping. No tolerance to arsenic developed. The greatest effect of dipping was obtained during the winter months, followed by autumn, summer, and spring. The shrinkage in milk production was 6.2, 3.8, 1.6, and 0.2 percent, respectively, for the first four days following dipping.

The phosphorus partition in the blood of rachitic and nonrachitic calves, F. J. STARE and C. A. ELVEHJEM (*Jour. Biol. Chem.*, 97 (1932), No. 2, pp. 511-524, fig. 1).—Holstein calves were divided into six lots of four head each at the Wisconsin Experiment Station and were fed the same basal rachitogenic ration. Lot 1 received the basal ration only, while the remaining lots received in addition cod-liver oil, aerated cod-liver oil, sunlight, tomatoes plus sunlight, and tomatoes, respectively. The calves were bled when from 8.5 to 9 months old, at which time the calves in lots 1 and 6 were definitely rachitic, while the other lots were in good physical condition.

The experimentally produced rickets caused a decided decrease in inorganic phosphorus, which in turn caused a decrease in the acid-soluble and total

phosphorus. The decrease in total phosphorus was slightly greater than could be accounted for by the change in inorganic phosphorus alone, due to a slight but definite decrease in ester phosphorus and possibly a slight decline in lecithin phosphorus. The difference between total phosphorus and the combined acid-soluble and lecithin fractions was less than 3 to 4 percent in most cases. Remarkably uniform results were obtained for inorganic phosphorus in rickets when analyses were made on whole blood immediately after withdrawal. Supplementing the diet of rachitic calves gradually returned the phosphorus fractions to normal.

The distribution of the phosphorus fractions between the plasma and blood corpuscles from normal and rachitic calves is given in tabular form. Evidence is also presented to show that the analysis of inorganic phosphorus in plasma does not give a complete picture of the total change in the inorganic phosphate fraction during rickets.

A study of the milk, blood, and excreta of cows fed moderate and excessive amounts of irradiated yeast or ergosterol, A. F. HESS, R. F. LIGHT, C. N. FREY, and J. GROSS (*Jour. Biol. Chem.*, 97 (1932), No. 2, pp. 369-377, fig. 1).—Milk from cows fed about 300 g of irradiated yeast daily was found to be highly antirachitic and prevented or cured rickets in infants. While the yeast used had a very high concentration of vitamin B₁, the titer of this vitamin in the milk was not increased. Yeast feeding did not increase the phosphorus, calcium, or ash content of the milk nor the inorganic phosphorus or calcium content of the serum. Feeding excessive nontherapeutic amounts of irradiated ergosterol caused a slight but definite rise in the calcium, phosphorus, and ash content of the milk and a rise in the concentration of calcium and especially of phosphorus in the serum. These increases were less marked in the milk of cows producing a large volume of milk daily. When irradiated yeast was fed in excessive quantities the blood contained about 1 unit of vitamin D per 1.5 g, and the same amounts were found in the blood of cows fed about three times as much irradiated ergosterol.

Cows receiving 300 g of irradiated yeast daily excreted about 25 percent of the vitamin D ingested in the feces, but none was recovered from the urine. Histological examination of various organs showed no lesions on the cellular structure or blood vessels of cows fed excessive amounts of irradiated ergosterol over long periods, and analyses of the bone ash showed the percentages to be within normal limits. It was determined that the lower the daily production of butterfat the higher was the concentration of vitamin D in the fat, and also that the greater the daily production of milk the greater was the total number of vitamin D units in the milk although the units per quart may be lower.

How milk freezes, F. B. BALDWIN, JR., and W. B. COMBS (*Milk Dealer*, 21 (1932), No. 12, pp. 46, 47, figs. 5).—A study was undertaken at the Minnesota Experiment Station to determine the manner in which milk freezes. Shotgun cans and 8-gal. milk cans filled with whole milk were subjected to freezing temperatures under varying conditions. Observations were made by immersing the hand into the milk to feel the ice crystal formation.

The milk fat rose to the top before freezing began. Ice crystal formation began simultaneously under the shoulders of the 8-gal. cans and at the point where the top of the milk and the atmosphere met in the shotgun cans and around the outside of the base of the cans. As freezing progressed ice crystals collected around the first-formed nuclei and began to creep up from the base. At the same time the bottom of the can began to fill with crystals. At no time was ice as thick on the bottom or halfway up the sides as it was around the base or under the shoulders of the can. The cream layer froze, and due to the force exerted by the continued greater concentration of the unfrozen

portion assumed a convex form. A small unfrozen core always remained in the center of the can.

Analyses showed that the frozen part of the milk contained more than twice as much butterfat as the unfrozen portion. The proportion of fat in the frozen milk was high in the cream layer, while that from the sides and bottom contained very small amounts.

Thawing and sampling partially frozen milk, F. B. BALDWIN, JR., and W. B. COMBS (*Milk Dealer*, 22 (1932), No. 1, pp. 54, 56).—The Minnesota Experiment Station undertook a study to determine the proper method of thawing partially frozen milk in order to obtain an accurate sample for butterfat analysis. The whole milk studied was partially frozen in 8-gal. cans in a cold room maintained at from 0° to -10° F. Three methods of thawing this milk were employed: (1) By the injection of direct steam into the can, (2) placing the can in a water bath, and (3) by allowing hot water to run down the sides of the can.

The average time required to thaw the cans of milk by the steam method was less than 1 minute. The butterfat percentage and the specific gravity of the original milk were 3.54 and 1.0309 and for the thawed milk 3.4 and 1.0297, respectively. In a water bath at 70° it required an average of 20 minutes to thaw the cans. The original milk contained 4.4 percent of butterfat and had a specific gravity of 1.0296, while the thawed milk tested 4.37 percent of butterfat and had a specific gravity of 1.03. Where milk was thawed by allowing water at 160° to flow down the sides of the can, it required an average of 5.3 minutes to melt the ice. The butterfat content of the original milk was 4.47 percent and it had a specific gravity of 1.0318. The thawed milk tested 4.46 percent of butterfat and had a specific gravity of 1.0316. These results show that partially frozen milk can be accurately sampled if thawed in the proper manner. When a few cans of such milk are received, thawing by allowing hot water to run down the sides of the cans appeared to be the best method, but where large numbers of cans are received the water bath gives the best results. The application of direct steam to frozen milk should be avoided, not only because of the inaccuracies encountered in sampling but because of the possible effect upon the milk.

Centrifugal separation of partially frozen milk, F. B. BALDWIN, JR., and W. B. COMBS (*Milk Dealer*, 22 (1932), No. 2, p. 43).—Concluding the above studies, experiments were undertaken to determine the effect of partial freezing and thawing of milk upon its efficient separation. Batches of milk were divided into equal parts, one of which was partially frozen in 8-gal. milk cans in a room maintained at from 0° to -10° F., while the other half served as a control. The partially frozen milk was thawed in one of the three manners previously described. After complete thawing, both the control and experimental batches were heated from 90° to 92° and separated in a power separator.

The fat tests of the skim milk showed no significant difference in the butterfat content of the control or partially frozen batches. These results show that partial freezing is not detrimental to efficient centrifugal separation if cream is completely thawed by any of the three methods and properly warmed before separating.

The heat coagulation of milk, I, II (*Jour. Dairy Sci.*, 15 (1932), Nos. 4, pp. 331-343, figs. 3; 5, pp. 345-366, figs. 16).—The U.S.D.A. Bureau of Dairy Industry here reports two studies in a series to determine the factors responsible for variations in the stability of milks to heat.

I. *Variations in the compositions, heat stability, and other tests of milks from four cows during the course of a lactation period*, G. E. Holm, B. H. Webb, and E. F. Deysher.—The phase of the study reported in this paper dealt

with the extent to which the various tests commonly employed correlated with time of coagulation by heat of both fresh and evaporated milks from four cows throughout a lactation period.

The results showed no marked correlation between heat stability and the various tests and analyses made upon the milk. The so-called "rapid" tests, such as the acid test, the alcohol test, and the phosphate test, sometimes used for classifying milks for condensing, did not satisfactorily indicate the relative heat stability of the milks. The salt balance also showed no direct correlation with the heat stability, nor was the buffer intensity related to the stability. There was no clear relationship between the heat stability of fresh milks and of their evaporated products. The individual milks retained fairly constant values in many of the tests, the values being characteristic of the milk of each cow. The results conclusively demonstrate the inadequacy of the present knowledge of the heat stability of milk.

II. *The influence of various added salts upon the heat stabilities of milks of different concentrations*, B. H. Webb and G. E. Holm.—This phase of the study was undertaken to obtain more detailed information on the effect of different added electrolytes on the heat stability of milks of different concentrations.

In preliminary work it was shown that variations in time of coagulation with variations in the temperatures used were of a logarithmic nature. The variations were less for the 9 than for the 18 percent solids-not-fat milks. Temperatures of from 110° to 120° C. yielded results of greatest practical value, while higher temperatures often produced large errors in the results. The concentration of solids-not-fat was an important factor in forewarming in varying the relative effects. Forewarming at high temperatures lowered the stability of milks of higher solids-not-fat concentration, and this property was not restored by the addition of electrolytes, indicating that forewarming does not affect stability merely through changes in the equilibria of the soluble salts.

The heat stability of an 18 percent solids-not-fat concentration milk could not be predicted from the heat stability of the original milk. It was also found that when phosphates were used as neutralizers they either materially improved stability or did not greatly affect it. It was further confirmed that there are two types of milk, one stabilized by the addition of positively and the other by the addition of negatively charged electrolytes. It was shown that, in the lower concentration, milks were more sensitive to the effect of bi-, tri-, and quadrivalent ions and the monovalent H-ion, while in higher concentrations the monovalent potassium ion was also effective. Data are presented to show the effect of various electrolytes on the two types of milk at 9 and 18 percent solids-not-fat concentrations.

Data show that in studies of coagulation consideration must be given to phase concentration and that conclusions drawn from studies on milk of one concentration are not applicable to milks of different concentrations. At the lower concentrations of solids-not-fat, various electrolytes exhibited critical concentrations or ranges in which their effect was great.

Some observations on the effect of temperature of pasteurization on the acid coagulation of skim milk, L. M. THURSTON and J. L. BARNHART (*Jour. Dairy Sci.*, 15 (1932), No. 5, pp. 401-405, figs. 3).—In studying the effect of temperature of pasteurization on the manufacture of cottage cheese, the West Virginia Experiment Station observed that coagulation by culture-developed lactic acid occurred noticeably sooner when skim milk was pasteurized for 30 minutes at 85° C. (185° F.) than when pasteurized for the same period at 62.8° C. A test was, therefore, planned to determine the effect of pasteurizing

temperature on the time required for coagulation and on the curd tension, total acid developed, and pH concentration at the time of coagulation.

When the temperature of pasteurization was varied the curd tension, at the time a jelly-like curd was first formed, was roughly twice as great for raw skim milk and skim milks pasteurized at 62.8°, 68.3°, and 73.9° as for those pasteurized at 79.4° and 85°. The pH concentration and the total acids present were decreased slightly as the pasteurizing temperature increased up to 68.3°, but above this point the changes were more marked. The time required for coagulation changed but little as the temperature increased up to 68.3°, but was reduced materially at 73.9°, beyond which there was little further change.

The coli-aerogenes determination in pasteurization control, M. H. McCrady and E. Langevin (*Jour. Dairy Sci.*, 15 (1932), No. 4, pp. 321-329).—Based on the results of two series of studies from large as well as from small milk plants, the Provincial Bureau of Health of Quebec concluded that plate counts as a laboratory method of pasteurization control were not adequate and that supplementary laboratory methods were desirable. The supplementary method that seemed to give the most reliable control was coli-aerogenes determination. This recommendation was made because this organism is seldom found in properly pasteurized milk, because the addition of even small numbers of coli to such milk can be easily detected, and because coli readily become established and multiply in traces of milk in the more dangerous types of defects and on unsterilized surfaces of pasteurizing equipment. It was shown that milk could be delivered to the consumer containing coli in not more than from 10 to 20 percent of the 1 cc portions tested.

The B. coli content of raw and pasteurized milk, A. J. Slack and C. W. Maddeford (*Canad. Pub. Health Jour.*, 23 (1932), No. 12, pp. 574-578).—The Institute of Public Health, London, Ontario, made a study of the *Bacillus coli* content of various grades of milk under market and controlled laboratory conditions.

It was shown that laboratory methods for the control of pasteurizing plants must be simple enough so that tests could be reported within from 24 to 48 hours. While the absence of typical colon bacilli was not necessarily an indication of proper pasteurization, or even that the milk had been pasteurized, the presence of the organisms in small volumes of pasteurized milk indicated some fault in pasteurizing, cooling, or bottling the milk. The results showed that milk having colon bacilli in 0.1 cc amounts either was improperly pasteurized or contaminated subsequent to pasteurization.

Studies on Lactobacillus thermophilus, D. B. Charlton (*Jour. Dairy Sci.*, 15 (1932), No. 5, pp. 393-399).—In the routine bacteriological analyses of the Corvallis, Oreg., milk supply a higher bacterial count was noticed for the pasteurized milk of one plant than in the raw milk delivered to the plant. Further study led to the isolation of a *L. thermophilus* which agreed in almost every respect with the original description, but for which additional characteristics were recorded. This organism grew poorly on the nutrient agar used in routine platings, and the indistinct filamentous colony was sometimes pin point in size. However, the colony could be easily distinguished from the pin-point colonies of thermoduric streptococci. The organism grew better on Bacto-Proteose peptone than on ordinary peptone. The peculiar growth requirements and the relatively short period of viability characteristic of the organism, together with the fact that it is of rather uncommon occurrence, probably explains why it has not been more frequently isolated.

Is loose milk a health hazard? S. Flexner et al., edited by E. F. Brown and L. Spencer (*New York: Dept. Health, Milk Comm.*, 1931, pp. XV+254,

[figs. 40)].—In this report the Milk Commission of New York City points out the dangers to public health as a result of the sale of loose milk. The results of laboratory tests are given in support of the conclusion that this method of dispensing milk should be gradually done away with. A historical account is given of the progress that has been made in securing a pure milk supply for New York City. The regulations governing the production of the various grades of milk are also presented.

Substances adsorbed on the fat globules in cream and their relation to churning.—I, The churnability of artificial emulsions prepared with the known emulsifying agents of cream, H. F. WIESE and L. S. PALMER (*Jour. Dairy Sci.*, 15 (1932), No. 5, pp. 371–381).—In studies at the Minnesota Experiment Station fresh buttermilk, calcium caseinate, serum globulin, lactalbumin, and a crude egg yolk phospholipid were used as emulsifying agents in order to ascertain whether some of these materials might constitute the sole fat stabilizer in cream. In preparing the butterfat emulsions sufficient melted filtered butterfat to yield a 4 percent milk was added to a 1 percent dispersion of the emulsifier at 100° F. This mixture was homogenized, separated, standardized to 30 to 35 percent butterfat, and churned. Each butter was worked slightly, and then the type of emulsion present in the churned product was determined under the microscope.

It was found that fresh buttermilk contained a substance or substances having the ability to stabilize oil-in-water emulsions. It was probable that part of this material came from the surface of the fat globules during churning. The butterfat-in-buttermilk dispersion resembled whole milk in general appearance, microscopic structure, cream separation, and churnability. Stable emulsions of butterfat were prepared in dispersions of calcium caseinate, lactalbumin, globulin, and phospholipid. Such emulsions resembled whole milk in general appearance, formation of cream layer, and microscopic structure, but each showed an abnormal behavior either on separation or in churnability of cream. The best separation was obtained with the phospholipid emulsion and the best churning with the lactalbumin emulsion. These results indicate that no one of the milk constituents used behaved entirely like normal cow's milk. It also appeared that not one of the substances tested constituted the sole material adsorbed on the surface of the fat globules.

Cheese-ripening studies: Nitrogen requirements of lactic acid bacteria, I, II (*Canad. Jour. Res.*, 7 (1932), No. 4, pp. 364–369; 370–377).—Investigations previously noted (*E.S.R.*, 68, p. 242) were continued.

I. *The fractional analysis of various nitrogen sources used for the quantitative determination of the sugar-fermenting abilities of lactic acid bacteria*, B. A. Eagles and W. Sadler.—Using the method of Wasteneys and Borsook (*E.S.R.*, 52, p. 803), the nitrogen distribution was determined in nitrogen sources available commercially and in sources that could readily be prepared in the laboratory. Analyses showed that peptic casein digest broth contained from 55 to 63 percent of protein nitrogen, from 19 to 25 percent of peptone nitrogen, and from 14 to 17 percent of subpeptone nitrogen, according to the particular casein used. When less casein was used for digestion or the period of digestion was reduced, the total amount of nitrogen made available was lower, particularly with the subpeptone nitrogen fraction. With tryptic casein digest broth 70 percent of the nitrogen was in the subpeptone nitrogen fraction and about 28 percent in peptone nitrogen.

When the nitrogen sources tested were used in fermentation studies their suitability as a source was not always fully indicated by the nitrogen distribution picture, but the biological significance of the nitrogen distribution was usually

reflected in the influence on the sugar-fermenting abilities of the lactic acid bacteria.

II. *The influence of defined nitrogen sources on the sugar-fermenting abilities of lactic acid bacteria*, W. Sadler, B. A. Eagles, and G. Pendray.—The influence of 36 nitrogen sources on the sugar-fermenting abilities of five cultures isolated from cheese was investigated. The cultures were a gram-positive coccus that failed to liquefy gelatin, and the sugars glucose, mannose, and lactose were used in this work. The suitability of the nitrogen source was determined in terms of total titratable acidity produced by the organisms from defined sugars after 14 days' incubation at appropriate temperatures.

Peptic casein digest broth was a suitable source of nitrogen for each organism when prepared by the standard method and when the total nitrogen content of the broth was approximately 1 percent. Diluting the broth to 0.5 percent of total nitrogen usually reduced the titratable acidity obtained by one third. Tryptic casein digest broth containing approximately 1 or 0.5 percent of total nitrogen was unsuitable as a nitrogen source for two of the organisms, but at the 0.5 percent level was very suitable for the remaining organisms.

A broth prepared from a commercial peptone was a suitable source of nitrogen for all the organisms, but another commercial peptone, apart from the fermentation of mannose by two strains of organisms, was no more suitable than peptic casein digest broth containing 0.5 percent of total nitrogen. In a commercial hydrolyzed casein broth the nitrogen distribution gave a somewhat composite picture of the distribution in peptic and tryptic casein digest broth and was not suitable for cultures of all strains of organisms. The hydrolyzed casein broth containing 1 percent of total nitrogen was more suitable for the cultures in which it could be used than the same broth diluted to contain 0.5 percent of nitrogen.

By using certain of the nitrogen sources it was possible to differentiate between some of the groups of organisms studied. The results of the fermentation studies clearly show that if the "kind" of nitrogen made available is suitable the "amount" of nitrogen supplied is then equally important.

Methods for use in the bacteriological examination of dry milk and related powders, P. A. DOWN ET AL. (*Jour. Dairy Sci.*, 15 (1932), No. 5, pp. 383-389).—A report is submitted by the subcommittee on bacteriological methods of examining condensed, evaporated, and dry milk of the American Dairy Science Association giving an outline for making bacteriological examinations of dry milk and certain related powdered baby foods. The methods presented in this paper will be revised in accordance with the suggestions received before they are finally adopted.

Note on use of alkaline water blanks for plating dried milk products, P. S. PRICKETT and N. J. MILLER (*Jour. Dairy Sci.*, 15 (1932), No. 5, pp. 391, 392).—Because considerable difficulty has been encountered in counting bacterial colonies on plates prepared from dried milk products, due to tiny particles of undissolved protein, the authors made a study of methods to eliminate this difficulty without materially affecting the counts. More than 20 different alkaline solutions were tested upon various kinds of dried milk products. The best results were obtained with lithium hydroxide solutions, and such solutions showed no germicidal action. Counts obtained when M/5 and M/10 lithium hydroxide dilution blanks were used compared very favorably with parallel counts obtained with distilled water dilution blanks. With powdered milk products of low pH value the M/5 lithium hydroxide dilution seemed to give best results, while the M/10 dilution gave best results when the pH value was high. Since the fat had a tendency to churn out of these dilution blanks, excessive shaking of powdered milk dilutions should be avoided.

The viability of *Lactobacillus acidophilus* as affected by freezing in a sherbet mixture, C. C. PROUTY and H. A. BENDIXEN (*Jour. Dairy Sci.*, 15 (1932), No. 5, pp. 413-419).—At the Washington College Experiment Station an effort was made to increase the viability of *L. acidophilus* milk by preparing it in the form of a sherbet. A total of 28 such sherbets were made up, using four strains of *L. acidophilus* in their preparation. A study was made of the number of viable organisms remaining after 1, 2, 3, 5, and 7 days' storage at temperatures below -17° C.

The number of organisms in the sherbets carrying one strain of *L. acidophilus* were reduced to a few million per cubic centimeter after 5 days' storage, while under similar conditions several hundred million viable organisms were usually present in sherbets made with the other strains. Variations in viability also occurred in cultures of the same strain. It was found that a more rapid reduction of organisms occurred in the sherbets with the higher titratable acidity. Variations in sugar concentration caused no significant variation in the viability of the organisms. It was concluded that it is possible to prepare sherbets containing large numbers of viable *L. acidophilus* organisms after from 5 to 7 days' storage at temperatures below -17° when the more resistant strains having a high initial count are used in the manufacture and the titratable acidity of the sherbet is not permitted to exceed 1 percent.

Manufacturing chocolate ice cream: A study of its problems, S. L. TUCKEY, P. H. TRACY, and H. A. RUEHE (*Ice Cream Trade Jour.*, 28 (1932), No. 8, pp. 39-43).—Continuing this study (E.S.R., 64, p. 874) at the Illinois Experiment Station, it was shown that adding cold unhomogenized sirup to an unaged mix prolonged the whipping period when compared with an unaged mix. Homogenization of only the sirup had no appreciable effect on the whipping properties of the mix. Homogenization or aging the sirup with the mix gave the best whipping properties. Adding aged sirup to the mix at the freezer prolonged the freezing period. While all the constituents of cocoa sirup had a detrimental effect on whipping quality, the nonfatty material appeared to exhibit the greatest influence.

Both natural and Dutch process cocoas of high quality were satisfactory for making chocolate ice cream. Chocolate liquors tended to slow up the whipping of mixes more than the cocoa powders. A desirable flavor and color of ice cream was obtained by using three-fourths chocolate liquor and one-fourth cocoa.

VETERINARY MEDICINE

A compendium on the infectious diseases of animals, C. H. STANGE (*Ames: Iowa State Col.*, 1932, pp. [4]+137+[4]).—This mimeographed compendium deals with acute general infectious diseases (pp. 1-89), chronic infectious diseases (pp. 90-127), and infectious diseases caused by protozoa (pp. 128-137).

[Report of work in animal pathology by the Florida Station] (*Florida Sta. Rpt.* 1932, pp. 51, 54, 55).—The work under way here referred to (E.S.R., 67, p. 596) includes that with paralysis of the domestic fowl, by E. F. Thomas, and anaplasmosis in cattle, by D. A. Sanders.

[Report of work in Kansas in animal pathology and parasitology] (*Kansas Sta. Bien. Rpt.* 1931-32, pp. 100-108, 109, 110-113).—The work reported upon (E.S.R., 64, pp. 878, 880) includes that with losses of baby pigs and with cornstalk disease, by R. R. Dykstra and H. F. Lienhardt; abortion disease, by C. H. Kitselman and Lienhardt; blackleg, by J. P. Scott; shipping fever, by Dykstra, Lienhardt, Scott, and H. Farley; anaplasmosis, by Dykstra, C. A. Pyle, and Lienhardt; poultry diseases, by L. D. Bushnell and C. A. Brandly; histopathology of poultry diseases, by Lienhardt; and parasites (*Ascaridia*

lineata Schneid.), resistance of chickens to parasitism as affected by vitamin A, vitamin B, skim milk, blood loss, and worm infestations, and the embryology of *Onchocerca cervicalis*, all by J. E. Ackert.

Epizootic abortion and undulant fever: An epizootic-epidemiologic study, E. HENRICSSON (*Epizootischer Abortus und Undulantfieber: Eine Epizootologisch-epidemiologische Studie*. Stockholm: Staatl. Bakt. Lab., 1932, pp. XV+203, figs. 32; rev. in *Cornell Vet.*, 22 (1932), No. 4, pp. 387, 388).—Part 1 of this contribution from the Government bacteriological laboratory at Stockholm consists of an introduction (pp. 1–9), part 2 considers other views of epizootic abortion (pp. 10–21), part 3 the appearance and spread of epizootic abortion in Sweden (before 1859, from 1859 to 1930) (pp. 22–54), part 4 bacteriological and serological diagnosis (pp. 55–83), part 5 modes of dissemination of epizootic abortion (pp. 84–131), part 6 undulant fever and epizootic abortion (pp. 132–161), and part 7 prophylaxis of epizootic abortion and of undulant fever (pp. 162–185). Part 8 consists of appendixes (pp. 187–196), and part 9 of a bibliography (pp. 197–203).

Identity of the viruses causing "mad itch" and pseudorabies, R. E. SHOPE (*Soc. Expt. Biol. and Med. Proc.*, 30 (1932), No. 3, pp. 308, 309).—In continuation of the studies previously noted (E.S.R., 65, p. 872), the author found that serum from swine that had recovered from either "mad itch" or pseudorabies neutralized both viruses. This has led to the conclusion that the inciting agents of both infections are immunologically identical. The differences in the experimental disease produced by the two viruses, one of which was obtained from a cow in Iowa and the other received from A. Aujeszky of Budapest, Hungary, must be considered only as variations induced by two strains of the same virus.

[Contributions on parasitology] (*Jour. Parasitol.*, 18 (1931), No. 2, pp. 113, 114, 115, 116, 117, 118, 119, 121, 122, 124, 125, 126, 127, 128, 130, 131, 133).—Abstracts of contributions presented at the annual meeting of the American Society of Parasitologists, held at New Orleans, La., in December 1931, include the following: Yeast as a Factor in the Growth of the Fowl Nematode *Ascaridia lineata* (Schneider), by J. E. Ackert and T. D. Beach (p. 113); Viability of the Eggs of the Fowl Nematode *Ascaridia lineata* (Schneider) Exposed to Natural Climatic Factors, by J. E. Ackert and G. E. Cauthen (p. 113); Effects of Periodic Bleeding on the Resistance of Chickens to the Intestinal Nematode *Ascaridia lineata* (Schneider), by J. E. Ackert and D. A. Porter (p. 114); Life History of the North American Lung Fluke of Mammals, by D. J. Ameel (p. 114); Two Species of Coccidia [*Eimeria miyarii* Ohira and *E. separata* n. sp.] from the Norway Rat, by E. R. Becker and P. R. Hall (p. 115); Host Feeding in Its Relation to Parasite Reproduction in Avian Malaria, by G. H. Boyd (p. 115); Clinical Experiences with Hexylresorcinol against *Ascaris*, Hookworm, *Trichuris*, *Enterobius*, and *Taenia*, by H. W. Brown (p. 116); Susceptibility and Resistance in Helminthic Infestations, by A. C. Chandler (p. 116); Some Peculiar Relationships between Ectoparasites and Their Hosts, by H. E. Ewing (p. 117); The Seasonal Life History of *Anopheles maculipennis* with Reference to Humidity Requirements and "Hibernation", by S. B. Freeborn (p. 118); A Survey of Flies, Pigs, Fowls, Rats, and Mice in a Rural Community for the Intestinal Protozoa of Man, by W. W. Frye and H. E. Meleney (p. 118); A Pathogenic Nematode [*Neoaplectana glaseri*] of the Japanese Beetle, by R. W. Glaser (p. 119) (E.S.R., 66, p. 559); Some Studies on the Breeding Media, Development, and Stages of the Eye Gnat *Hippelates pusio* Loew (Diptera: Chloropidae), by D. G. Hall (p. 119) (E.S.R., 68, p. 789); A Comparative Study of the Eggs of Californian Anophelines [*Anopheles maculi-*

pennis Meig., *A. punctipennis* Say, and *A. pseudopunctipennis* Theob.], by W. B. Herms and F. M. Frost (p. 121); Effect of Five Species of *Eimeria* upon Egg Production of Single Comb White Leghorns, by W. T. Johnson (p. 122); A New Species of Tick [*Dermacentor halli*] from the Texas Peccary, by A. McIntosh (p. 124); The Effects of Coccidiosis upon the Weights of Chickens Inoculated during the 7th, 12th, and 13th Weeks (p. 125) and Preliminary Results in the Treatment of Coccidiosis in Chickens with Powdered Buttermilk (pp. 125, 126), both by R. L. Mayhew; The Life History of *Leucocytozoon anatis* Wickware, by E. C. O'Roke (p. 127) (see p. 281); The Prevalence of Human Infection with *Trichinella spiralis*, by F. B. Queen (p. 128); Some Effects of Splenectomy on the Blood of Carriers of Anaplasmosis, by C. W. Rees (p. 128); A Study of the Eggs of *Moniezia expansa*, by J. W. Scott and R. F. Honess (p. 130); The Development of *Oesophagostomum longicaudum* in the Pig, by L. A. Spindler (pp. 130, 131); and Production of Sterile Maggots [*Lucilia sericata* and *Phormia regina*] for Surgical Use, by G. F. White (p. 133).

[Contributions on parasitology] (*Jour. Parasitol.*, 19 (1932), No. 2, pp. 156, 157, 159, 160, 161, 170, 174, 176, 177, 178, 179, 180).—Abstracts of contributions presented at the annual meeting of the American Society of Parasitologists, held at Atlantic City, N.J., in December 1932, include the following: Detection of Proteins of *Haemonchus contortus* in Sera of Infected Sheep and Goats, by J. E. Stumberg (pp. 156, 157); Fatal Infections of *Trichostrongylus calcaratus* in Rabbits, by M. P. Sarles (p. 157); Age Resistance of Chickens to the Parasite *Ascaridia lineata*, by J. E. Ackert, D. A. Porter, and T. D. Beach (p. 157); Resistance to Infestation with *Trichinella spiralis* in Hogs, by G. W. Bachman and R. Rodriguez-Molina (pp. 159, 160); Pathogenicity of Metacercariae of *Nanophyetus salmincola* Chapin for Fish Hosts, by B. T. Simms (p. 160); Immunity to Coccidiosis in Chickens Produced by Inoculation Through the Ration, by W. T. Johnson (pp. 160, 161); Seasonal Incidence and Concentrations of Sand Fly Larvae in Salt Marshes (*Culicoides*), by J. B. Hull, W. E. Dove, and D. G. Hall (p. 170); Production of Sterile Maggots for Surgical Use—II, Disinfection with Sodium Hydroxide Followed by Formalin, by G. F. White (p. 170) (see above); A Species of *Cephalogonimus* from the Domestic Duck, by C. H. Alvey (p. 174); The Behavior of the Avian Malaras in the Common Fowl, an Abnormal Host, by R. D. Manwell (p. 176); The Control of *Leucocytozoon anatis* Wickware, by E. C. O'Roke (p. 177); Control of Poultry Coccidiosis by Chemical Treatment of Litter, by J. Andrews (p. 177); Relapse and Associated Phenomena in the *Haemoproteus* Infection of the Pigeon, by G. R. Coatney (p. 178); The Influence of an Increased Burden of Phagocytosis upon Malarial Infections of Birds, by W. Gingrich (pp. 178, 179); The Cytology of *Leucocytozoon anatis* Wickware—I, Gametogenesis, by R. K. Martin (p. 179); Additional Observations on the Use of Fouadin in the Treatment of *Dirofilaria immitis* Infestation in the Dog, by P. C. Underwood and W. H. Wright (p. 180); and Studies of Bovine Coccidiosis, by C. W. Rees (p. 180).

[Contributions on parasitology] (*Jour. Parasitol.*, 19 (1933), No. 3, pp. 242, 243, 244-246, 248, 249, 251, 252, 253, 254, fig. 1).—Contributions presented at the meetings of the Helminthological Society of Washington held in 1932 include the following: The Experimental Transmission of the Swine Lungworm *Metastrongylus elongatus* to Dogs, by J. E. Alicata (p. 242); Failure of Repeated Injections of *Trichina* Extracts [*Trichinella spiralis*] to Immunize Rats to Trichinosis, by J. T. Lucker (p. 243); The Dung Beetle *Ataenius cognatus* as the Intermediate Host of *Hymenolepis cantaniana*, by J. E. Alicata and M. F.

Jones (p. 244); A New Intermediate Host [*Paroxya clavuliger* Serv.] for *Cheilosporura hamulosa*, the Gizzard Worm of Poultry, by E. Cuvillier (pp. 244, 245); Two New Intermediate Hosts [*Onthophagus janus* and *O. pennsylvanicus*] for the Poultry Cestode *Hymenolepis carioca*, by E. Cuvillier and M. F. Jones (p. 245); A New Species of *Tetrameres* [*T. pattersoni*] from the Bobwhite, by E. B. Cram (pp. 245, 246); A Nematode, *Setaria labiato-papillosa*, from the Udder of a Cow (p. 246), *Onchocerca gutterosa* from the Cervical Ligament of Cattle in Puerto Rico (p. 246), and *Onchocerca flexuosa* from the Subcutaneous Tissues of an Antelope and from Subcutaneous Abscesses of a Deer (p. 246), all by G. Dickmans; A Second Record of the Occurrence of *Gongylonema* in Deer, by J. T. Luckner (pp. 248, 249); A Note on *Cysticercus ovis*, by P. C. Underwood (p. 251); A Case of Heavy Ascarid [*Ascaris equorum*] Infestation in a Colt, by P. C. Underwood and E. E. Wehr (pp. 251, 252); Further Notes on the Life History of *Gastrophilus intestinalis* (p. 252) and Occurrence of *Ascaridia lineata* in California Valley Quail (p. 252), both by E. E. Wehr; The Occurrence of *Stephanurus dentatus* in Northern United States, by J. E. Alicata (p. 253); and Comparative Data Relative to Incidence of Worm Parasites in Confined and Non-confined Chickens, by E. Cuvillier and M. F. Jones (p. 254).

Bibliography of helminthology for the year 1931, compiled by A. WALTON (*St. Albans, Eng.: Imp. Bur. Agr. Parasitol., 1932, pp. 81*).—In this bibliography of helminthology for 1931 (E.S.R., 68, p. 363), the contributions in 425 publications are listed and an author index included.

On the prophylactic action of vitamin A in helminthiasis, P. A. CLAPHAM (*Jour. Helminthol., 11 (1933), No. 1, pp. 9-24*).—In experiments conducted with a view to determining the action of vitamin A in the prophylaxis of helminthiasis, *Heterakis gallinae* in the chicken and *Parascaris equorum* in albino rats were used. The findings indicate that in *Heterakis* infestation the vitamin content of the diet has no effect on the course of the infestation. In ascariasis in rats, however, the vitamin affects significantly the hatching, survival, and rate of development of the larvae within the host.

A list of 33 references to the literature is included.

Helminths and coccidia from Ohio bobwhite, C. VENARD (*Jour. Parasitol., 19 (1933), No. 3, pp. 205-208*).—This is a report of examinations made of the helminth and coccidial parasites found in 67 adult Ohio bobwhites (*Colinus virginianus virginianus* L.) shot on the wing in the field, 5 species of nematodes, fragments of cestodes probably of the genus *Hymenolepis*, and 3 species of coccidia, namely, *Eimeria dispersa* Tyz., *E. tenella* R. & L., and *E. acervulina* Tyz., having been found. Of the 3 species of coccidia discovered, only *E. dispersa* had previously been reported from this host. *E. tenella* was successfully transmitted from the bobwhite to the chicken. The nematodes were *Dispharynx spiralis* (Molin), *Seurocyrnea colini* (Cram), *Heterakis gallinae* (Gmel.), *H. bonasae* (Cram), and *Subulura strongylina* (Rud.).

Cross-infection experiments with coccidia of rodents and domesticated animals E. R. BECKER (*Jour. Parasitol., 19 (1933), No. 3, pp. 230-234*).—The author finds that "the rat, even when quite young, is not susceptible to infection with *Eimeria magna* of the rabbit, *E. scabra*, *E. deblickei*, and *E. perminuta* of the pig, *E. faurei* of the sheep, *E. smithi* of the ox, *E. caviae* of the guinea pig, and *E. tenella* and *E. maxima* of the chicken. The rat coccidia, *E. miyairii* and *E. separata*, are not infective to mice, even when they are quite young, cottontail rabbits, guinea pigs, and striped ground squirrels.

"A previously unreported interspecific cross-infection is possible—*E. magna* Pérard from the Belgian hare (*Lepus cuniculi*) can complete its development

and produce pathological symptoms and even death in the North American cottontail rabbit (*Sylvilagus floridanus mearnsi*). *E. separata* and *E. miyairii* obtained from the wild Norway rat, *Epemys norvegicus*, can be successfully cultivated in the albino rat, derived originally, of course, from the Norway rat. A number of other attempted cross-infections resulted negatively."

Occurrence of *Coccidioides immitis* in lesions of slaughtered animals, M. D. BECK (*Soc. Expt. Biol. and Med. Proc.*, 26 (1929), No. 6, pp. 534-536).—During the course of an epidemiological investigation of coccidial granuloma in Kern County, Calif., in which 38 specimens from slaughtered animals were examined during a period of 3 months, lesions from 6 cattle and 1 sheep were proved to be due to *C. immitis*. The author considers it improbable that humans are infected from such animals, but rather that both man and animals are infected from the same source.

A contribution to actinomycosis caused by the *Actinobacillus* (actinobacillosis), B. LIEBSTER (*Beitrag zu der durch den Actinobazillus Verursachten Actinomykose (Actinobazillose)*. Inaug. Diss., Vet. Hyg. Inst., Univ. Leipzig, 1932, pp. 28).—This account is presented in connection with a review of the literature, of which a list of 32 references is included.

A method of preserving *Actinomyces bovis* in its "ray fungus" form, I. A. MERCHANT (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 4, pp. 630, 631, fig. 1).—The author has found that the best preservative for this purpose is a concentrated sugar solution prepared by dissolving 1 lb. of granulated sugar in 12 oz. of distilled water. By immersing a bottle containing the ingredients in hot water solution is hastened. A 1 percent solution is added as a preservative. "Equal parts of exudate from the actinomycotic lesion and sugar solution are thoroughly mixed. The mixture is placed in a bottle which can be sealed tightly. The micro-organisms in the exudate which has been preserved by this method and kept at room temperature for 4 years, appear like those present in fresh exudate."

The experimental transmission of anaplasmosis by *Dermacentor andersoni*, C. W. REES (*Parasitology*, 24 (1933), No. 4, pp. 569-573).—This is an account of investigations conducted at Jeanerette, La., which have shown that anaplasmosis in cattle may be transmitted by the Rocky Mountain spotted fever tick as previously announced (*E.S.R.*, 67, p. 597).

It was found that "(1) larvae may acquire the infection by engorging on a bovine whose blood contains anaplasms and may transmit the infection as nymphs to susceptible bovines and (2) in a similar manner the nymphs may acquire the infection and transmit it as adults. The test of 'hereditary' transmission was negative, i.e., the larvae did not apparently acquire the infection from adult females which engorged on carriers of anaplasmosis. Conditions of transmission by *D. andersoni* are the same as those which have thus far been determined by me for *D. variabilis* [*E.S.R.*, 67, p. 311]. The incrimination of these two species of tick points to the possibility that anaplasmosis occurring anywhere within the known range of distribution of that disease in the United States may be tick borne so far as a coincident distribution of known tick carriers can establish this possibility."

Relation of vitamin "B" to infection and immunity with special reference to *Bacillus welchii*, W. B. ROSE (*Soc. Expt. Biol. and Med.*, 25 (1928), No. 8, pp. 657, 658).—The author considers the work reported to indicate that nutritional factors deserve important consideration in immunologic studies, and that vitamin B in particular merits special attention.

Borrelitoses: Fowl-pox, molluscum contagiosum, variola-vaccinia, E. W. GOODPASTURE (*Science*, 77 (1933), No. 1987, pp. 119-121).—The generic

name *Borreliota* is proposed by the author for the specific coccoid granules first described by A. Borrel² as the actual virus of fowl pox. Later investigators have shown these to constitute the essential component of the cellular inclusions and to be fractionally infective, filtrable, and specifically agglutinable by immune serum.

The terminology proposed includes *Borreliota variolae hominis*, specific corpuscles of smallpox (Paschen bodies, elementary corpuscles); *B. variolae bovis*, specific corpuscles of vaccinia (Paschen bodies, elementary corpuscles); *B. variolae equi*, specific corpuscles of horsepox; *B. variolae porci*, specific corpuscles of swine pox; *B. variolae ovium*, specific corpuscles of sheep and goat pox; *B. mollusci*, specific corpuscles of molluscum contagiosum (Lepschütz corpuscles); and *B. avium*, specific corpuscles of fowl pox (Borrel corpuscles).

Studies on the dissociation of the Brucella group, W. L. MALLMANN and F. GALLO (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 3, pp. 267-279, pl. 1).—Following a historical review, the authors give the history of the cultures studied and report experimental work carried on at the Michigan Experiment Station.

In the course of the work "rough forms of *Brucella* were obtained by aging on liver-infusion agar slants, followed by further aging in nutrient veal broth. The rough forms of *Brucella* studied were similar to pure-line rough strains of the paratyphoid group. Classification of S forms of *Brucella* by dye plates and hydrogen sulfide production does not hold for rough forms. Rough forms of *Brucella* were changed to S type by passage through guinea pigs. The value of typing S forms of *Brucella* by dye plates and hydrogen sulfide is confirmed by the return of R types to their original groups by these two methods."

Undulant fever: An epidemic of subclinical infection with Brucella, P. DOOLEY (*Arch. Int. Med.*, 50 (1932), No. 3, pp. 373-379, fig. 1).—The blood of 41 percent of 263 individuals using infected raw milk, obtained from a herd of about 100 Holstein cows in which there had previously been an epidemic of infectious abortion, was found to contain *B. abortus* agglutinins.

The identity of *C. oedematoides* and *B. sordellii*, F. HUMPHREYS and F. L. MELENEY (*Soc. Expt. Biol. and Med. Proc.*, 25 (1928), No. 7, pp. 611-614).—The authors conclude that *Clostridium oedematoides*, described by Meleney, Humphreys, and Carp (*E.S.R.*, 62, p. 260), is identical with the putrefactive pathogenic anaerobe *Bacillus oedematis sporogenes*, named and described by A. Sordelli in 1923³ and redescribed by Hall and Scott in 1927 as *B. sordellii* (*E.S.R.*, 62, p. 261), which stands by priority over *C. oedematoides*.

The serological identity of strains of *Erysipelothrix rhusiopathiae* of ovine and porcine origin, H. MARSH (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 4, pp. 584-586).—The results obtained in investigations at the Montana Experiment Station are considered to show clearly that the three strains of *E. rhusiopathiae* (one from a Montana lamb, one from a New Zealand lamb, and one from a case of swine erysipelas) are serologically identical as far as agglutinins are concerned.

***Limnea viatrix* d'Orb. infected by cercariae of *Fasciola hepatica* at Buenos Aires** [trans. title], J. BACIGALUPO (*Compt. Rend. Soc. Biol. [Paris]*, 111 (1932), No. 38, p. 828).—The snail *L. viatrix* has been found to be the natural intermediate host of the liver fluke (*F. hepatica*) in Argentina.

The tenacity of foot-and-mouth disease virus in milk and dairy products, I, II [trans. title], F. TERBRÜGGEN (*Deut. Tierärztl. Wchnschr.*, 40 (1932), Nos. 9, pp. 129-134; 34, pp. 529-533).—A report of studies, the details of which are presented in tabular form. Lists of 28 references to the literature are included.

² *Compt. Rend. Soc. Biol. [Paris]*, 57 (1904), pp. 642, 643.

³ *Compt. Rend. Soc. Biol. [Paris]*, 89 (1923), No. 19, pp. 53-55.

Investigations on the diseases of the Psittacidae [trans. title], G. PACHECO (*Mem. Inst. Oswaldo Cruz*, 26 (1932), No. 2, pp. 169-233, pls. 4, fig. 1; *Eng. abs.*, pp. 230-233).—This is a report upon observations of diseases of the Psittacidae liable to be confused with the psittacosis of parrots.

Diagnostic significance of precipitin tests with Anderson phosphatide fractions from human, bovine, and avian tubercle bacilli, C. A. DOAN (*Soc. Expt. Biol. and Med. Proc.*, 26 (1929), No. 8, pp. 672-677).—A contribution from the Rockefeller Institute for Medical Research in New York.

Culturing bovine tubercle bacilli, M. EVANOFF and H. C. SWEANY (*Soc. Expt. Biol. and Med. Proc.*, 26 (1929), No. 6, p. 456).—In this contribution a direct culture method for obtaining growth and identifying tubercle bacilli from bovine material is described. The bovine organisms isolated grow directly on cream-egg-milk medium, but not on glycerin-egg-milk medium. Direct inoculation and treatment with 3 percent hydrochloric acid and 3 percent sodium hydroxide are recommended for more complete results.

The occurrence of tubercle bacilli in eggs [trans. title], M. KLIMMER (*Berlin. Tierärztl. Wchnschr.*, 48 (1932), No. 46, pp. 737-739).—In a review of the literature, a list of 17 references to which is included, the author has found that of 1,333 eggs from tuberculous hens 5.7 percent contained tubercle bacilli. Of these 1.4 percent were detected through cultures and animal inoculations and 4.2 percent microscopically.

A natural infection of the sharp-tailed grouse and the ruffed grouse by *Pasteurella tularensis*, R. G. GREEN and J. E. SHILLINGER (*Soc. Expt. Biol. and Med. Proc.*, 30 (1932), No. 3, pp. 284-287).—The authors here record the isolation of *P. tularensis* from a sharp-tailed grouse (*Pedioecetes phasianellus*) and from a ruffed grouse (*Bonasa umbellus togata*) in Minnesota, made during the course of routine examinations and study of game birds collected in various areas of the State in the fall of 1932.

A natural infection of quail by *B. tularense*, R. G. GREEN and E. M. WADE (*Soc. Expt. Biol. and Med. Proc.*, 26 (1929), No. 7, pp. 626, 627).—The presence of *B[acterium] tularense* in one bird of a covey which apparently was afflicted with disease and was known to be diminishing in size would indicate tularemia as the probable destructive factor, confirming the work of Parker previously noted (*E.S.R.*, 61, p. 871).

Experimental tularemia in muskrats, R. G. GREEN, E. M. WADE, and E. T. DEWEY (*Soc. Expt. Biol. and Med. Proc.*, 26 (1929), No. 6, pp. 426, 427).—The authors have found the muskrat to be very susceptible to an experimental infection with *B[acterium] tularense*. The pathology produced by the infection is similar to that seen in rabbits and guinea pigs, but the lesions in the muskrat are apt to be more marked. It is indicated that tularemia may occur in nature as a disease of muskrats.

Experimental tularemia in birds, R. G. GREEN and E. M. WADE (*Soc. Expt. Biol. and Med. Proc.*, 25 (1928), No. 8, p. 637).—Preliminary experiments indicate that the Hungarian partridge (see *E.S.R.*, 60, p. 673) is highly susceptible to tularemia, a fatal infection resulting from an open inoculation of a skin abrasion. The pigeon and the ring-necked pheasant appear to be relatively more resistant to tularemia. The domestic fowl appears to be absolutely resistant to the disease.

Experimental tularemia in ring-necked pheasant, R. G. GREEN, E. M. WADE, and W. KELLY (*Soc. Expt. Biol. and Med. Proc.*, 26 (1928), No. 3, pp. 260-263).—The authors find that while an experimental symptomless infection of tularemia may be produced in the ring-necked pheasant, the difficulties in establishing the infection indicate that probably this bird would be immune to tularemia under conditions of natural infection.

The germicidal efficiency of chlorine and chlorine compounds, E. C. McCULLOCH (*Vet. Med.*, 28 (1933), No. 3, pp. 92-97, figs. 3).—A practical account of the germicidal value of chlorine and chlorine compounds.

Hexylresorcinol as a general vermicide, P. A. CLAPHAM (*Jour. Helminthol.*, 10 (1932), No. 4, pp. 195-208).—The author concludes that hexylresorcinol is as effective as a vermicide as a bactericide. After referring to the work of Lamson and his associates, who have shown it to be effective in removing some nematodes (*E.S.R.*, 65, p. 568; 67, p. 310), the author reports having obtained similar results with cestodes. Experiments on free-living nematodes and larvae of parasitic nematodes have shown it to be extremely effective. In each case the drug acts as a protoplasmic poison by precipitating the protein contents.

The photodynamic action of methylene blue on certain viruses, J. R. PERDRAU and C. TODD (*Roy. Soc. [London], Proc., Ser. B*, 112 (1933), No. B 777, pp. 288-298).—The authors have found that "the viruses of vaccinia, herpes, fowl plague, louping-ill, Borna disease, Fujinami's tumor, and canine distemper, as they exist in filtrates or other fluids devoid of living cells, are highly sensitive to the photodynamic action of methylene blue—a concentration of 1 part in 100,000 inactivating each of these viruses within a few minutes under suitable illumination. The viruses of foot-and-mouth disease and of infectious ectromelia, on the other hand, are more resistant to the photodynamic action of the dye. The inactivation of the viruses by methylene blue and visible light appears to be an oxidative process, as in experiments with the viruses of herpes and vaccinia no inactivation took place in the absence of free oxygen. The viruses of herpes, Borna disease, and fowl plague, as they exist in freshly prepared suspensions of living cells from infected animals, are very much more resistant to the photodynamic action of the dye than they are in cell-free filtrates. This 'protection' of the viruses is only exercised by living cells, dead cells being without effect. No such protection by the living animal cell was observed in the case of the virus of louping-ill, and in that of the virus of vaccinia the amount of protection obtained was very small."

Vaccines and their importance in animal husbandry, J. B. BUXTON (*Husbandry [Norfolk Co. Council]*, 2 (1932), No. 4, pp. 3-7; 3 (1933), No. 1, pp. 3-8).—The first part of this contribution (pp. 3-7) deals with the nature of vaccines and their value to animal husbandry. This is followed in the second part (pp. 3-8) by an account of tuberculosis and the use of the B.C.G. method of immunizing cattle against it.

The American groundsels species of *Senecio* as stock poisoning plants, A. B. CLAWSON (*Vet. Med.*, 28 (1933), No. 3, pp. 105-110, figs. 5).—Feeding experiments with three American species of *Senecio* are reported.

"*S. integerrimus* is shown to be capable of poisoning horses and cattle, but it is pointed out that because of its habits of growth it is not a source of particular danger on the range or in pastures. *S. longilobus* is shown to be one of the more poisonous of the American species of *Senecio* and a source of danger for grazing animals. Data are given regarding its toxicity for cattle, horses, and sheep, and it is pointed out that the young leaves are more poisonous than the older leaves or the stems. *S. spartioides* is added to the list of plants known to be poisonous."

Investigations on the structural changes in the bones of normal cattle and of cattle receiving calcium- and phosphorus-deficient diets [trans. title], **A. THEILER** (*Denkschr. Schweiz. Naturf. Gesell.*, 68 (1932), No. 1, pp. X+154, pls. 22; rev. in *Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 1, pp. 115-117).—The first part of this work (pp. 1-36) deals with the structure and thickness of the cortical portions of the bones of cattle and the second part (pp. 37-154) with experimental rickets and osteomalacia in cattle.

Bovine contagious abortion: The need for further research, H. R. SEDDON (*Agr. Gaz. N. S. Wales*, 43 (1932), No. 11, pp. 821-829).—Reporting upon the status of knowledge of this disease, the author calls attention to the need for more exact information concerning it.

[**Contributions on infectious abortion**] (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933) No. 3, pp. 309-337).—Contributions on infectious abortion presented at the annual meeting of the United States Live Stock Sanitary Association held at Chicago in 1932 include the following: Control of Bang's Disease under Range or Semi-range Conditions, by W. J. Butler and D. M. Warren (pp. 309-318); Bang's Disease in Relation to Interstate Cattle, by T. E. Munce (pp. 318-327); Some of the Things We Should Recognize concerning the Agglutination Test for Bang's Disease, by C. R. Donham (pp. 327-335); and Report of Committee on Bang's Disease, by C. P. Fitch et al. (pp. 335-337).

Can *Bacillus abortus* Bang penetrate through the normal skin, and is this an important channel of entrance in bovine infectious abortion? [trans. title], O. BANG and H. C. BENDIXEN (*Medlemsbl. Danske Dyrlægefor.*, 15 (1932), No. 1, pp. 1-11; *abs. in Cornell Vet.*, 22 (1932), No. 2, pp. 195-198).—Studies made with a view to determining whether the main portal of entry of *B. abortus* is by way of the alimentary tract or in other ways are reported. Two attempts at infection by bandaging infected material to the shaved skin proved positive in one, and a colony of *B. abortus* was obtained in cultures from the popliteal and mammary lymph nodes although the blood was negative at a dilution of 1:25. A small piece of cotton soaked with positive placental scrapings which was placed on a teat scarified with five to six scratches not deep enough to draw blood, resulted in infecting the placenta and the udder. Infection through the unshaved skin of the pastern resulted from the application of a bandage of infected material to a cow and two heifers.

The application for 4 days of infective material to the right front teat, the skin of which was scarified although no blood exuded, resulted in the infection of the placenta and of the milk.

The occurrence of Johne's disease of cattle in Valtellina [trans. title], E. SIMONATTI and P. BRUNELLI (*Proflassi*, 6 (1933), No. 1, pp. 1-7, figs. 7; *Fr. abs.*, p. 7).—Detailed case reports are given of chronic paratubercular enteritis of cattle, which is recorded from Valtellina, Italy, for the first time.

Studies on the control of Johne's disease, W. A. HAGAN and A. ZEISSIG (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 3, pp. 391-407).—The authors present data to support the conclusion that "Johne's disease in cattle can be diagnosed with a reasonable degree of accuracy by the aid of avian tuberculin injected intravenously. The dosage of the tuberculin must be carefully graded so as to induce sharp reactions in affected cattle and give none in normal cattle. . . . We have found complement fixation useful as a confirming test, used with the allergic test. It is useful especially in those animals which have developed clinical signs of the disease and do not react to the allergic test, for these animals practically always react serologically."

Mal de caderas of cattle or pasteurellosis paresis of Paraguay [trans. title], R. URÍZAR and V. G. FRACCHIA (*An. Inst. Nac. Parasitol. [Asunción]*, 2 (1929), No. 2, pp. 5-31, figs. 8).—This contribution deals with a disease of cattle, later accounts of which by Migone and Peña and by Urízar have been noted (*E.S.R.*, 68, p. 250).

Pasteurellosis paresis or mal de caderas of cattle [trans. title], R. URÍZAR, V. FRACCHIA, and J. B. RIVAROLA (*An. Inst. Nac. Parasitol. [Asunción]*, 2 (1929), No. 2, pp. 33-68, figs. 2).—This contribution on the disease above noted reports experimental studies of its cause, presented in connection with an 11-page list of references to the literature.

A six-month study of bovine mastitis in herd of 100 cows, F. B. HADLEY and W. D. FROST (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 3, pp. 345-355).—Contributing from the Wisconsin Experiment Station, the authors report that in a herd of 102 cows examined monthly for a period of 6 months 30 were found to be affected with definite clinical mastitis. It was found that 60 cows in the herd were normal or nearly so, none of these having a total bacterial count above 20,000 per cubic centimeter. In this herd there were 12 cows classed as suspicious cases, which, with the 30 clinical cases, made a total of more than 40 percent having either evident or latent mastitis sometime during the course of the 6 months.

It is concluded that "when a streptococcus becomes implanted in the udder it has a remarkable ability to remain. While the data presented do not warrant making a diagnosis of mastitis on merely demonstrating streptococci in the udder, it does show that clinical symptoms are much more likely to be present in those cows shedding streptococci than in those cows whose milk does not contain them. The etiological agent of mastitis found most frequently in this herd is a member of the alpha hemolytic group of streptococci, known as *S[treptococcus] mitis* according to Holman's system of classification and as *S. agalactiae* by other investigators. Other alpha types were found, viz, *S. fecalis* and *S. salivarius*, in a few cases. A few cases also were caused by members of the colon-aerogenes group."

A biological and bacteriological study of bovine mastitis, J. M. ROSELL and W. T. MILLER (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 4, pp. 587-607).—The authors report upon examinations made of samples of milk from each quarter of 70 cows for the presence of mastitis, both bacteriologically and by application of several chemical and biological tests.

Of the 280 quarters tested, 82.8 percent were found to be abnormal by one or more of the various methods used. The type of mastitis appeared to be of a chronic nature, no acute cases having been found.

"The number of quarters, of the 232 found to be diseased, were positive to the individual tests as follows: Chlorine test, 192 (82.7 percent); catalase test, 167 (72.6 percent); bromothymol blue test, 69 (30 percent); macroscopic and microscopic sediment test, 137 (59.5 percent); palpation, 151 (65.6 percent); black cloth test, 15 (6 percent)."

Streptococci were present in 41 percent of the diseased quarters and were present in 21 percent of the 48 quarters which failed to react to any of the tests, although in a second test of the latter many failed to show streptococci. The authors describe a method for applying the chlorine test in the stable, which may be used in connection with the bromothymol blue test.

"Forty-one strains of streptococci isolated during this work were tested. Two strains could be classified as *S[treptococcus] bovis*, one as *S. mitis*, and three as *S. fecalis*. It is believed that the presence of these six strains may possibly be due to outside contamination. The 35 other strains could be classified as *S. agalactiae (mastitidis)*.

"The *S. agalactiae (mastitidis)* strains acidified, coagulated, and partially reduced litmus milk in 48 hours at 37° C., did not change methylene blue milk in 24 hours (several strains caused slight reduction), fermented lactose (pH. 4.4 to 4.6), saccharose, and salicin. They did not act upon mannite, raffinose, or inulin, did not liquefy gelatin, and failed to reduce nitrates to nitrites. They were not hemolytic."

The account is presented in connection with a list of 51 references to the literature.

[Contributions on bovine tuberculosis] (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 3, pp. 407-414, 420-427, 432-440).—Contributions presented on tuberculosis of livestock at the annual meeting of the United States Live Stock Sanitary Association, held at Chicago from November 30 to December 2, 1932, include the following: The Three Types of Tubercle Bacilli in Live Stock Sanitary Control Work, by L. Van Es; Progress of Cooperative Tuberculosis Eradication Work, by A. E. Wight; and Accrediting Range and Semi-range Cattle as Tuberculosis-Free, by F. E. Mollin.

A detailed study of no-lesion, tuberculin-reacting cattle, E. G. HASTINGS, W. WISNICKY, B. A. BEACH, and J. MCCARTER (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 4, pp. 565-583).—A detailed study at the Wisconsin Experiment Station of two groups of cattle consisting of one-reactor-per-herd animals indicates that some other organism or organisms than the bovine tubercle bacillus may sensitize cattle to tuberculin. The organisms suspected of being implicated include the avian and the human tubercle bacilli, possibly Johne's bacillus, and the saprophytic members of the tubercle group of bacteria.

"It is believed that the observations herein recorded indicate that the herd history may, in the final stages of the eradication of bovine tuberculosis, serve as a supplement to the tuberculin test. It may prove possible to avoid the removal of a considerable part of those animals which now form the no-lesion group without endangering the eradication work in any way by allowing herd history to influence the judgment as to the condition of the herd as regards tuberculosis."

A general survey of the protozoan fauna of the rumen of the Chinese cattle, T. S. HSIUNG (*Bul. Fan Mem. Inst. Biol.*, 3 (1932), No. 7, pp. 87-107, pl. 1).—This is a report of a survey made of the protozoan fauna of the rumen of Chinese cattle, based upon examinations of 30 animals. Some species were found to be specific for the host and some commonly found in both cattle and sheep. Of the 66 forms identified, 6 species are described as new, 1 of which represents a new genus, *Pingius*.

The protozoan fauna of the rumen of the Chinese sheep, T. S. HSIUNG (*Bul. Fan Mem. Inst. Biol.*, 2 (1931), No. 3, pp. 29-43, pl. 1).—This is chiefly a preliminary report of a survey of the protozoan fauna of the rumen of sheep slaughtered in an abattoir in Tientsin, China. Forty species of protozoa are here recorded, of which one is described as new. The incidence of the various species is shown in tabular form.

Anthrax protection tests, J. REICHEL and J. E. SCHNEIDER (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 3, pp. 376-387).—The authors conclude that "it is possible to establish an infective dose for sheep with a virulent anthrax culture of value in the protection test. Such a sheep protection test will reveal the relative protective value of anthrax antigen, anthrax vaccine (southern), and anthrax bacterin. It will also permit of the test for potency of anti-anthrax serum. Anthrax antigen and anthrax vaccine (southern), so tested, increased resistance in the sheep injected 30 days prior to the administration of the infective dose. Anthrax bacterin, as used in the tests, failed to increase the resistance of the sheep. Additional sheep protection tests with the same infective dose should be made with anthrax antigen and anthrax vaccine (southern) to establish further the lasting qualities of the immunity."

"Cripples" in lambs, W. L. STEWART (*Vet. Jour.*, 89 (1933), No. 2, pp. 63-69, pl. 1).—An account is given of a disease of young lambs, occurring on certain farms in the north of England and known as "cripples", "stiffness", and "rickets", which affects moderately well-nourished lambs from the age of

7 to 14 days. The infection is characterized by stiffness of gait and by an abnormal fragility of the long bones and ribs, resulting in their frequent fracture from comparatively simple causes. The crippled lambs are said to show symptoms resembling the so-called stiff lambs reported by H. J. Metzger and W. A. Hagan in New York.⁴

"Cripples" in lambs, W. L. STEWART (*Vet. Rec.*, 13 (1933), No. 6, pp. 109-112).—This contribution relates to the disease of lambs noted above.

"Pulpy kidney" in lambs (*Aust. Council Sci. and Indus. Res. Pam.* 35 (1932), pp. 29).—This consists of two papers as follows: "Pulpy Kidney," or Acute Infectious Entero-toxaemia of Sucking Lambs Due to *B[acillus] ovis* (Bennetts), by D. T. Oxe (pp. 9-25) (*E.S.R.*, 67, p. 600), and "Pulpy Kidney", a Post-mortem Change in Experimental Infectious Entero-toxaemia, by H. W. Bennetts (pp. 26-29).

Experiments in the treatment of stomach worms in sheep, F. H. S. ROBERTS (*Queensland Agr. Jour.*, 38 (1932), No. 6, pp. 493-507).—The author finds carbon tetrachloride in a 2 cc adult and 1 cc lamb dose, combined with liquid paraffin to make 5 cc, the most successful method of treatment for the stomach worm *Haemonchus contortus*. Arsenic and Epsom salts and copper sulfate and mustard in the doses used are also highly efficient, with little to choose between them but with the former drench perhaps the cheaper and more efficient. Tetrachlorethylene gave very disappointing results, and in any case its cost as compared with that quoted for carbon tetrachloride, etc., would prohibit its use, the treatment of 1,000 sheep costing a little more than 22s. Further experiments are required with sodium arsenite and copper sulfate and with sodium fluosilicate before any definite opinion on their efficiency against *H. contortus* can be expressed.

Field observations on erysipelas in swine herds, C. F. HARRINGTON (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 3, pp. 492-503).—The author reports having found swine erysipelas to be a serious hazard to swine production on certain farm premises and in some definite areas. It is pointed out that many farms may become abandoned to hog raising because of the annual destruction of the herd as the result of the recurrence of the disease.

A laboratory tube test and a whole blood rapid agglutination test for the diagnosis of swine erysipelas, W. H. SCHOENING, G. T. CREECH, and C. G. GREY (*North Amer. Vet.*, 13 (1932), No. 12, pp. 19-25, figs. 3).—The authors describe a tube agglutination test and a rapid plate agglutination test using whole blood, perfected for use in the diagnosis of swine erysipelas due to *Erysipelothrix rhusiopathiae*. This disease has been reported from various sections of the United States in recent years as occurring in the acute form.

An agglutination test for swine erysipelas, H. W. SCHOENING and G. T. CREECH (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 3, pp. 503-508).—A description is given of an agglutination technic developed as noted above. Further experimentation in the laboratory and field studies of the technic reported is required to determine its practical application to the diagnosis of swine erysipelas in the field.

The antigenic properties of bacteriophage lysates of *Salmonella suipestifer*, I, II, P. KENDRICK (*Amer. Jour. Hyg.*, 17 (1933), No. 2, pp. 297-317, pls. 3; 318-328).—The first contribution reports upon a preliminary study made of the cultures and bacteriophage lysates to be used in further experimental work. The second contribution deals with the rate of disappearance of injected bacteriophage from the blood stream of rabbits, experimental data being re-

⁴ Cornell Vet., 17 (1927), No. 1, pp. 35-44, figs. 2.

corded for 21 rabbits relative to the disappearance of *B[acterium] suispestifer* bacteriophage.

Water hemlock (*Cicuta maculata* L.) poisoning in swine, L. V. SKIDMORE (*Vet. Jour.*, 89 (1933), No. 2, pp. 76-80, fig. 1).—In experiments in Nebraska the consumption of nearly 5 lb. of green tops of *C. maculata* did not produce symptoms of poisoning in a hog. Seven days later this animal succumbed in 1 hour 15 minutes after having consumed 275 g of the ground-up roots.

Equine encephalomyelitis antiserum, E. RECORDS and L. R. VAWTER (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 4, pp. 608-616).—Contributing from the Nevada Experiment Station, the authors present what they consider to be a reasonably practical, proven, and satisfactory method of producing and testing anti-equine encephalomyelitis serum at a moderate cost.

Of seven horses treated substantially in accord with this outline, only one has failed to respond to hyperimmunization satisfactorily. No abscesses, loss of condition, or deaths have occurred in the serum-producing horses which could be attributed to the hyperimmunizing and bleeding process per se. The presence of equine anemia infection in the serum horses or their subsequent infection from horses used for virus production appears to be the biggest hazard in areas where this disease exists. This disease not only renders the infected serum horse useless, but there is apparently grave danger of its dissemination by the finished serum if used shortly after its production. Work not covered in this paper indicates that anti-encephalomyelitis serum has marked value as a therapeutic agent. Given early in an attack, the death rate is lowered, convalescence is shortened, and the percentage of animals showing permanent damage is greatly reduced. Preliminary trials would indicate that its value for immunizing purposes is limited. Any passive immunity conferred appears at best to be slight and short lived.

Studies of horses treated for strongylidosis, E. E. SLATTER, S. E. PARK, and R. GRAHAM (*North Amer. Vet.*, 14 (1933), No. 3, pp. 19-33, figs. 14).—"In a group of 140 U.S. Army horses, 6 died of strongylidosis before treatment was instituted and 5 more animals succumbed from strongyle infestation during the period of treatment. Clinical symptoms of parasitism in other horses of this group were supported by positive fecal examinations. Oil of chenopodium and carbon tetrachloride were administered for *Strongylus* spp. infestation. The treatment of horses, with relatively few exceptions, was followed by noticeable improvement. In a group of 21 clinical cases subjected to repeated treatment, general improvement was correlated with increased body weight and undulating but rising hemoglobin content of the blood. Badly infested animals responded slowly, but gradually improved in general appearance and ability to work. The increase in body weight during the period of 6 months doubtless was influenced favorably by the rations and rest during the summer months of 1932."

Canine coccidiosis due to *Eimeria canis*, L. V. SKIDMORE and C. B. McGRATH (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 4, pp. 627-629).—The authors report on a case of coccidiosis in the dog at Lincoln, Nebr., which they believe to be due to *E. canis*, as described by C. M. Wenyon⁵ in 1923 and O. Nieschulz⁶ in 1924.

Laboratory and clinical diagnosis of canine distemper, M. L. MORRIS (*North Amer. Vet.*, 14 (1933), No. 3, pp. 34-48, figs. 6).—The author finds that by a study of the blood picture it is possible to detect canine distemper in the

⁵ Ann. Trop. Med. and Parasitol., 17 (1923), No. 2, pp. 231-288, pls. 6, figs. 2; abs. in Jour. Amer. Vet. Med. Assoc., 65 (1924), No. 4, pp. 496, 497.

⁶ Berlin. Tierärztl. Wchnschr., 40 (1924), No. 17, pp. 220, 221, figs. 2.

incubation stage by the rise in white blood count and the lowered nuclear index. The nuclear index, or relation between the immature and the mature polymorphonuclear leucocytes, was found to be a dependable index in following the progress of the virus of canine distemper and the associated organisms.

The effect of blood loss upon the resistance of chickens to variable degrees of parasitism, D. A. PORTER and J. E. ACKERT (*Amer. Jour. Hyg.*, 17 (1933), No. 1, pp. 252-261, fig. 1).—In this contribution from the Kansas Experiment Station the authors report upon two experiments on a total of 300 White Leghorn chickens, conducted with a view to determining whether the resistance of chickens to variable degrees of parasitism with the intestinal nematode *Ascaridia lineata* (Schneid.) is affected by periodic blood losses.

“The results of the experiments indicate that repeated loss of blood may lower the resistance of chickens to the intestinal nematode *A. lineata*. When large numbers (500 or 300) of eggs were fed, three of the four lots bled showed significantly longer worms than did the control lots of chickens (not bled). While several comparisons did not result in significant differences (due to variability), the worms from the bled lots of chickens were longer than those from the controls in nine of the ten groups in which comparisons were made. The lowered resistance is thought to have been due to a physiological reaction in which the growth-inhibiting mechanism was affected.”

A direct method for making total white blood counts on avian blood, D. BLAIN (*Soc. Expt. Biol. and Med. Proc.*, 25 (1928), No. 7, pp. 594-596).—Having found the methods employed with mammalian blood unsatisfactory in making total leucocyte counts of avian blood, the author has devised the method here described.

The character and extent of poultry diseases as evidenced by data obtained in Government inspection work, L. D. IVES (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 3, pp. 480-486).—A report on the diseases observed in the course of inspection of all live poultry unloaded for sale in New York City and on the inspection of the dressed poultry used in canning plants putting up poultry food products or in plants preparing full-drawn poultry for sale.

[**Work with diseases of poultry in Rhode Island**] (*Rhode Island Sta. Rpt.* [1932], pp. 57-59).—The work of the year with diseases of poultry briefly referred to (E.S.R., 67, p. 318) includes coccidiosis, blackhead, fowl pox, and an unrecognized respiratory infection in chickens and pheasants.

The control of poultry coccidiosis by the chemical treatment of litter, J. ANDREWS (*Amer. Jour. Hyg.*, 17 (1933), No. 2, pp. 466-490, pl. 1, figs. 4).—The author has found in the experimental work reported that Toxite, a proprietary disinfectant the base of which appears to be a mixture of the higher phenoloids, including in all probability cresylic and xylenylic fractions, when sprayed on litter once each week controlled mixed poultry coccidiosis under conditions of poor sanitation (cleaning at least once in three weeks) and deliberate contamination.

“In the continued absence of cleaning, Toxite did not protect flocks against coccidial epidemics indefinitely. Its coccidiacidal activity was apparently limited by the accumulation of organic matter in the litter. Half-strength Toxite applied twice each week in the absence of cleaning postponed the normal development of coccidial epidemics, but not for as long a time as full-strength Toxite applied once each week. A water-borne mixture of Toxite base of the same chemical strength as regular Toxite applied each week in the absence of cleaning failed to postpone the normal development of a coccidial epidemic. Evidence has been adduced which shows that Toxite was more active against freshly passed oocysts than against infective oocysts.”

Poultry coccidiosis control by the chemical treatment of litter, J. ANDREWS (*Poultry Sci.*, 12 (1933), No. 2, pp. 133-140, figs. 2).—In experimental work with a chemical spray consisting of a mixture of coal-tar acids in a light mineral oil, its application on a litter once each week controlled avian coccidiosis of various types under conditions of poor sanitation and deliberate contamination, as above noted. "In the absence of cleaning, Toxite protected a flock against coccidiosis for 4 weeks but not for 5. Regular weekly application of Toxite, supplemented by cleaning and removal of litter at least every 3 weeks, is recommended to control coccidiosis successfully. A water-borne mixture of Toxite base of the same chemical strength as Toxite had apparently no value in controlling coccidiosis."

Etiology of an uncomplicated coryza in the domestic fowl, J. B. NELSON (*Soc. Expt. Biol. and Med. Proc.*, 30 (1932), No. 3, pp. 306, 307).—In the author's investigation "an uncomplicated coryza was initiated and subsequently maintained in a flock of disease-free birds by the intranasal injection, through the palatine cleft, of exudate originally obtained from naturally infected fowl. A nasal discharge, the only consistent symptom, generally appeared after an incubation period of 24 to 28 hours and continued, on the average, for 11 days.

"The etiological agent of the coryza was not established by the injection either of bacteria isolated from aerobic plates or of exudate filtered through Berkefeld V and N candles. . . . It was subsequently found, however, that the fluid from blood agar cultures of exudate which had been filtered through certain Berkefeld V candles contained a small, nonmotile, Gram-negative bacillus apparently in a pure state. The organism grew sparsely in fluid blood at the base of slanted agar but failed to colonize on the slant or on the surface of aerobic blood agar plates. Colonization was later initiated by sealing the plates with modeling clay.

"A typical coryza was produced in normal birds, 35 in all, by injecting the bacillus into the palatine cleft. The same organism was recovered from the nasal exudate induced in these birds, at first by filtration and later by the use of sealed plates. The duration of the period of nasal discharge, averaging 5 days, was shorter than that of the coryza produced by exudate. There was also an indication that the bacillary coryza was less communicable by direct contact. . . . It was found that recovery from the coryza of bacillary origin was commonly followed by a state of resistance to reinfection."

While cultural studies are not complete, the failure of the organism to colonize on aerobic blood agar plates, together with an inability to multiply in media containing sufficient accessory material of plant origin to support growth of *B[acillus] influenzae*, appears to exclude it from the group of true hemophilic bacteria.

Observations on the use of pigeon-pox virus as a cutaneous vaccine for fowl-pox in an egg-laying contest, F. H. ORR, JR., and M. W. EMMEL (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 4, pp. 562-564).—The authors report that the use of pigeon pox virus as a cutaneous vaccine for fowl pox proved most satisfactory to the management of the Alabama egg-laying 1931-32 contest, the results seeming to warrant its use in future contests in the State.

Experiments on immunization against laryngotracheitis in fowls, F. R. BEAUDETTE and C. B. HUDSON (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 3, pp. 460-476).—Contributing from the New Jersey Experiment Stations, the authors point out that swabbing of the cloacal mucosa or that of the bursa of Fabricius with a virus suspension results in an infection of these parts (E.S.R., 67, p. 747). The disease process runs its course in about 1 week, after which

the cloaca, as well as the respiratory tract, is immunized against it. It is thought that successful infection of the cloaca probably depends upon the dose of virus.

"It is important to induce cloacal infection in every bird, otherwise the ones not so infected are exposed to the infection eliminated by those successfully vaccinated. If cloacal infection is induced in every bird there is no loss attending immunization, otherwise the losses are almost entirely confined to the birds in which cloacal infection was not successful. In any event the loss has never been unusual. Vaccination of young chicks was not satisfactory, and in birds 6 months old the percentage of takes was not large enough, although a larger dose of virus may compensate to some extent. The most desirable age for vaccination seems to be between 2 and 3 months. Infection of the cloaca may be facilitated by rotating the swab on the mucosa or by the addition of an inert abrasive substance. Limited observations seem to indicate that vaccinated birds do not continue to carry the virus in the cloaca."

Leucosis of the fowl, a diagnostic study, H. HEINSEN (*Leukose der Hühner, eine Diagnostische Studie. Inaug. Diss., Hyg. Inst. Tierärztl. Hochsch., Hannover, 1930, pp. 68*).—An investigation of 20 fowls suffering from leucosis showed 25 percent to be affected with the myeloid type, 70 percent with the lymphatic type, and 5 percent with the myelolymphatic type. The report is presented in connection with a list of 65 references to the literature.

Report of the conference of official research workers in animal diseases of North America on standard methods of pullorum disease in barnyard fowl, November 29, 1932 (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 3, pp. 487-491).—This report deals with (1) the diagnosis of the disease in young chicks and (2) with serological diagnosis of pullorum disease (carrier condition) in maturing and in adult breeding stock.

A study of pullorum disease diagnostic tests, R. GRAHAM, F. THORP, JR., and J. P. TORREY (*Poultry Sci.*, 12 (1933), No. 2, pp. 112-119).—"Comparisons of the results of the pullorin or intradermal, the rapid plate, the rapid whole blood stained antigen, and the field tube tests with the standard tube test showed a lower correlation between positives than between negatives, or conversely, a higher agreement between negatives than between positives. Using the standard tube test as an arbitrary standard of perfection, the pullorin test agreed in 72 to 91 percent of the fowls tested; the rapid plate test agreed in 72 to 96 percent; the rapid whole blood antigen in 72 to 90 percent; and the field tube test agreed in 81 to 95 percent."

Newly recognized poultry disease, F. R. BEAUDETTE and C. B. HUDSON (*North Amer. Vet.*, 14 (1933), No. 3, pp. 50-54).—This contribution from the New Jersey Experiment Stations presents 11 case reports of an apparently new disease, first met with in August 1932 in Hunterdon County, N.J. The disease is characterized by a swelling of the periorbital tissues, which may extend over the face and frequently involves the wattles and submaxillary space. The swollen wattle is frequently cyanotic, and the swelling occasionally involves the top of the head. The swellings appear and disappear in a relatively short time. Sneezing and mild respiratory symptoms are frequently seen, but on autopsy one does not find the exudate peculiar to infectious laryngotracheitis.

Some observations on the development of the caecal worm, *Heterakis gallinae* (Gmelin, 1790) Freeborn, 1923, in the domestic fowl, A. D. BAKER (*Sci. Agr.*, 13 (1933), No. 6, pp. 356-363, figs. 8).—It is pointed out that the reports of studies which have been made of the development of *H. papillosa* in all probability refer to *H. gallinae*.

In reviewing the literature the author has found that there is no general agreement as to the length of time required for the cecal worm to complete its development within the chicken, records ranging from 24 to 61 days. The author has found that the development of *H. gallinae* in the chicken is frequently completed within a 30-day period. "Blackhead frequently makes its appearance in chickens by the second and third weeks after ingestion of embryonated cecal worm egg material. Cecal worms recovered from chickens badly infested with blackhead have been observed as being markedly checked in their development. It appears evident that excessive development of blackhead in the ceca of chickens tends to render conditions rather unsuitable for the development of *H. gallinae*."

It is thought that the influence of blackhead is sufficient to explain the difference in the findings of those that have studied the life cycle of the cecal worm.

On the life-history of *Heterakis gallinae*, P. A. CLAPHAM (*Jour. Helminthol.*, 11 (1933), No. 2, pp. 67-86, figs. 16).—This is a report of studies of the fowl nematode *H. gallinae*, better known as *H. papillosa*, presented in connection with a list of 24 references to the literature.

The life history of *Leucocytozoon anatis* Wickware, E. C. O'ROKE (*Jour. Parasitol.*, 18 (1931), No. 2, p. 127).—An account is given of a parasitic protozoan, *L. anatis*, which infests both wild and domestic ducks, in which it causes serious juvenile losses. Gametocytes which are present in the red blood cells are ingested by the female of the blood-sucking black fly *Simulium venustum*.

The blackfly, *Simulium venustum* Say, and a protozoon disease of ducks, C. R. TWINN (*Canad. Ent.*, 65 (1933), No. 1, pp. 1-3).—The author reviews recent literature on the disease of ducks due to *Leucocytozoon anatis* and common in Canada, which was first reported by Wickware at Ottawa in 1915 (*E.S.R.*, 33, p. 483) and by O'Roke in 1930 as transmitted by *S. venustum* (*E.S.R.*, 64, p. 565). The author then considers the possible role of this black fly in its dissemination, and records are given of its occurrence in the several Provinces of Canada.

Endemic paratyphoid infection in turkeys, L. F. RETTGER (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 3, pp. 452-460).—This general account of paratyphoid infection in turkeys contributed from the Connecticut Storrs Experiment Station includes a history of recurring epizootics on two farms situated 90 miles apart, supplemented by general remarks on blackhead.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Everglades Substation] (*Florida Sta. Rpt.* 1932, pp. 164-167, 196-198, figs. 2).—The progress results of studies of water control in soils being conducted by R. V. Allison et al. in cooperation with the U.S.D.A. Bureau of Agricultural Engineering are briefly reported.

[Agricultural engineering investigations at the Kansas Station] (*Kansas Sta. Bien. Rpt.* 1931-32, pp. 45-47, 119, 120).—The progress results are reported of studies on the influence of method of harvesting and baling alfalfa hay on quality and on the efficiency of the combined harvester-thresher for harvesting grain sorghums, by F. J. Zink; the effect of the method of storing combined wheat upon quality, by F. C. Fenton and C. O. Swanson; and soil erosion and moisture conservation.

Surface water supply of the United States, 1931, Parts 3, 6, 12A, 12C (*U.S. Geol. Survey, Water-Supply Papers* 713 (1933), pp. IX+346, fig. 1; 716 (1933), pp. X+347, fig. 1; 722 (1933), pp. VIII+188, fig. 1; 724 (1933), pp. VI+

166, fig. 1).—Part 3 of this report, prepared in cooperation with the States of Illinois, Indiana, Kentucky, New York, North Carolina, Ohio, Tennessee, Virginia, and West Virginia, presents the measurements of flow made on streams in the Ohio River Basin during the year ended September 30, 1931. Part 6, prepared in cooperation with the States of Kansas, Missouri, Montana, Nebraska, North Dakota, and Wyoming, part 12 A, prepared in cooperation with the States of Idaho, Montana, and Washington, and part 12 C, prepared in cooperation with the States of Oregon and Washington, present corresponding measurements for the Missouri River Basin and the North Pacific slope drainage basins (part 12 A dealing with the Pacific slope basins in Washington and the upper Columbia River Basin and part 12 C with the Pacific slope basins in Oregon and lower Columbia River Basin), respectively.

Surface water supply of Hawaii, July 1, 1930, to June 30, 1931 (*U.S. Geol. Survey, Water-Supply Paper 725 (1933), pp. IV+99*).—This report, prepared in cooperation with the Territory of Hawaii, presents the measurements of flow made on certain streams and ditches in the Territory during the year ended June 30, 1931.

Daily river stages at river gage stations on the principal rivers of the United States, compiled by M. W. HAYES (*U.S. Dept. Agr., Weather Bur., Daily River Stages, 29 (1931), pp. III+165*).—This volume, containing the daily river stages for 1931, is the twenty-ninth of a series on the principal rivers of the United States (*E.S.R.*, 66, p. 472).

[Irrigation investigations at the New Mexico Station] (*New Mexico Sta. Rpt. 1932, pp. 73-80*).—The progress results are reported of investigations on duty of water for cabbage, rate and cause of rise of ground water in the Mesilla Valley, potato culture under irrigation, water requirements and the economical use of water for cotton, rainfall supplemented by underground water in the production of crops of low water requirements, and the effect of fertilizers and frequency of irrigation on the yield and the keeping and marketing qualities of the Early Grano onion. These investigations are being conducted in cooperation with the U.S.D.A. Bureau of Agricultural Engineering.

The physical properties of soil of interest to agricultural engineers, L. D. BAVER (*Agr. Engin., 13 (1932), No. 12, pp. 324-327, figs. 6*).—This contribution from the Missouri Experiment Station briefly discusses those physical factors of soils which are of vital interest to agricultural engineers.

The conclusion is drawn that the moisture content at which tillage is most efficient is dependent upon the consistency of the soil. It is characterized by the moisture content of the soft, friable consistency. Mechanical manipulation causes only a temporary formation of a certain structural condition. Frequency of manipulation is determined by the need for the restoration of this condition of structure.

The conservation of moisture by cultivation is associated with the control of weeds, with the maintenance of such structural qualities of the soil as enhance water absorption, and to some extent with the hindering of evaporation because of the formation of a dust mulch.

Drainage problems are closely related to the structural relationships in soils. The effectiveness of subsurface drainage is wholly dependent upon the degree of aggregation and the noncapillary porosity of the soil profile. The permeability of a soil is determined by the rate of percolation through its least permeable horizon or layer. The depth of the heavy subsoil layer determines the effectiveness of tile drainage in most upland soils. The porosity of the soil also determines the effectiveness of supplementary lateral ditches in the drainage of lowland soils.

A comparison of methods of mechanical analysis of soils, A. CARNES and H. D. SEXTON (*Agr. Engin.*, 14 (1933), No. 1, p. 15).—Studies conducted at the Alabama Experiment Station on methods of mechanical analysis of soils with reference to their utility in connection with soil dynamics studies are briefly reported.

The pipette methods of analysis of soils investigated were found to consume too much time where a great number of analyses were to be made. The same was true with the elutriation method. The Bouyoucos hydrometer method was found to be rapid and sufficiently accurate for work in soil dynamics and erosion studies.

Principles of reinforced concrete construction, F. E. TURNEAURE and E. R. MAURER (*New York: John Wiley & Sons; London: Chapman & Hall*, 1932, 4. ed., rev., pp. XI+461, figs. 220).—This is the fourth revised edition of this book (E.S.R., 42, p. 580), in which due consideration is given to the latest experiments and developments in methods of calculation and design. Some of the more important changes include revised formulas and diagrams for the design of beams, including circular sections subjected to bending and compression; adaptation of diagrams to the use of any desired value of n ; discussion of recent tests on beams and columns; amplification of material on flat slabs, including detailed treatment of footings; more adequate development of the analysis of continuous beams; application of the slope-deflection method to building frames, including haunched beams, with general results for typical cases; application of method of moment distribution to continuous girders and frames; complete detailed analysis of the arch with methods of arriving at tentative designs; torsional stresses in beams; and effect of shrinkage and plastic flow on stresses in beams, columns, and arches.

Shear tests of reinforced brick masonry beams, D. E. PARSONS, A. H. STANG, and J. W. MCBURNEY ([U.S.] *Bur. Standards Jour. Res.* 9 (1932), No. 6, pp. 749-768, figs. 7).—Eighteen beams of reinforced brick masonry were tested to determine their resistance to failure by diagonal tension. The beams were 14 ft. long and about 1 ft. square in cross section. Beams of three different types of construction were tested, an equal number with each of two kinds of brick. A 1:3 portland cement mortar, with addition of lime equal to 15 percent of the volume of the cement, was used in all beams. Each beam contained six 0.5-in. square steel bars as tensile reinforcement. Tensile and shear tests of the bond between mortar and brick and pull-out tests of steel bars embedded in brick masonry were made to supplement the data from the beam tests.

Positions of the neutral axes in the beams varied with the kind of brick, arrangement of bricks in the beams, and loads. The ratio of depth to neutral axis to depth of the tensile reinforcement increased with an increase in the number and total thickness of mortar joints in the masonry. The position of the neutral axis corresponded to that calculated by means of the design formulas applying to beams of reinforced concrete, with an assumed modulus of elasticity of the masonry equal to from 50 to 70 percent of that of the masonry piers.

The failures of all beams were accompanied by cracks near the ends of the beams, between a support, and the nearer load. The cracks were evidence of failures by diagonal tension.

Maximum shearing stresses for the different types of beams ranged from 65 to 159 lb. per square inch. Resistance to diagonal tension increased with an increase in the proportion of bricks laid with staggered joints. Shearing strengths of the beams were in the same order as shearing and tensile bond strengths of small masonry specimens.

With the relatively absorbent bricks used, tensile and shearing strengths of the masonry were much greater when bricks were wetted before laying than when laid dry.

Bond strengths as determined by pull-out tests of 0.5-in. square deformed bars embedded about 8 in. in brick masonry ranged from 870 to 950 lb. per square inch. Differences in the kinds of brick and curing conditions did not cause significant changes in bond strength.

Spreading of liquids on solid surfaces: The anomalous behavior of fatty oils and fatty acids, with experiments leading to a tentative explanation, R. BULKLEY and G. H. S. SNYDER (*Jour. Amer. Chem. Soc.*, 55 (1933), No. 1, pp. 194-208, figs. 8).—Several lines of experimental evidence are described in support of the view that the interfacial tension between metals and petroleum oils is substantially greater than between metals and fatty oils or between metals and fatty acids. The energy requirements for spreading on solids being the same as for spreading on liquids, the fatty oils and fatty acids should spread more readily than mineral oils on metal surfaces. Experimentally, fatty oils and fatty acids spread little or not at all while mineral oils spread apparently without limit. The nonspreading of the fatty liquids must therefore be regarded as anomalous.

The higher fatty acids do not wet polished metal surfaces in the ordinary sense, but roll about freely. They deposit an adsorbed film on the surface which reduces the surface energy to a low value. Thin layers of mineral oil containing fatty acids rupture spontaneously on metal surfaces. The explanation is the same as when a similar phenomenon occurs on water, namely, the formation of an underlying film of low surface energy. Thin layers are unstable on areas of low surface energy. Fatty oils and fatty acids are prevented from spreading on metal surfaces by the great reduction in the surface energy of the metal which is brought about to some distance in advance of the spreading layer by the breaking away of an expanding ring or by the condensation of vapors.

Public Roads, [March-April 1933] (*U.S. Dept. Agr., Public Roads*, 14 (1933), Nos. 1, pp. 20+[2], figs. 6; 2, pp. 21-36+[2], figs. 2).—These numbers of this periodical report the current status of Federal-aid road construction as of January 31 and February 28, 1933, respectively. No. 1 also contains an article entitled Tar Surface Treatment of Low Cost Roads (pp. 1-20), and No. 2 an article entitled The Wisconsin Financial Survey (pp. 21-36).

Certain errors of temperature measurement, L. M. K. BOELTER (*Agr. Engin.*, 14 (1933), No. 1, pp. 16-23, figs. 3).—In a contribution from the University of California, data and other technical information are presented on the measurement of ordinary temperatures by means of mercury thermometers, long distance indicating thermometers, resistance thermometers, and thermocouples, special attention being given to the common corrections and precautions necessary to attain an accuracy of $\pm 0.5^{\circ}$ F.

Piston temperatures in a solid-injection oil engine, G. F. MUCKLOW (*Engineering [London]*, 134 (1932), No. 3493, pp. 745-747, figs. 8).—Studies conducted at the University of Manchester are reported, the object of which was to determine the temperature of the piston of a solid-injection heavy-oil engine at a number of points distributed over the crown and walls and under a variety of running conditions.

With reference to piston temperatures at different loads, the highest temperature was reached at a point in the middle of the central knob of the piston, increasing about 50 percent from less than half load to full load. The temperatures at other points in the central knob were also very high. At points on the edge of the crown the temperature was considerably below that of the

central knob. The temperatures recorded at points below the first set of rings and in the piston skirt showed but little variation with changes of load. At points on the thrust slipper of the piston the temperature was in each case slightly below that of the corresponding point in the upper slipper.

As the jacket outlet temperature was raised, the temperature at points on the central knob decreased. At points close to the edge of the crown the temperature remained very nearly unchanged. The temperatures at points in the piston skirt increased with increase in jacket outlet temperature, the rise being appreciably greater for points situated in the upper side of the piston skirt.

Removal of the diaphragm plate caused a slight fall in piston temperature, the cooling effect increasing with increase of load. The decrease in temperature was greatest at points situated in the piston knob.

The ignition and combustion process in the coal dust engine, W. WENTZEL, trans. by K. GOGGIN (*Forsch. Geb. Ingenieurw., Forschungsheft 343 (1931)*, pp. [4]+23, figs. 21; trans. in *Fuel*, 11 (1932), Nos. 5, pp. 177-196, figs. 19; 6, pp. 222-228, figs. 2).—An experimental apparatus is described for determining the time required for ignition and combustion of coal dust which is injected by means of compressed air into compressed heated air. With this apparatus the effects of temperature and density of the combustion air, injection pressure, particle size, and kind of coal on the ignition lag and combustion time were investigated.

The ignition lag was found to be independent of excess air and almost independent of injection pressure. It increased with decreasing temperature of the combustion air. The ignition limit was reached at a definite temperature, and the ignition lag and the position of the ignition limit were found to depend on the density of the combustion air. The size of the smallest particles present determined the ignition lag, and if no very fine particles were present in the dust the ignition lag increased rapidly. The richer the coal in gas the lower was the ignition limit. For temperatures of combustion air near the ignition limit, the values for ignition lag in the case of prepared dust lay between 0.01 and 0.03 second.

Combustion time was found to be independent of the temperature of the combustion air so long as this was not too near the ignition limit. On the other hand there was a strong dependency on excess air and on injection pressure. The density of the combustion air had no effect on combustion. Combustion time was also greatly dependent on the grain size composition of the dust. With sufficient excess air and good injection the values for combustion time of prepared dust lay between 0.15 and 0.35 second, according to the grain size composition and kind of coal. These results are discussed in their application to the operation of the coal dust engine.

V-belt drives for farm motors and equipment, H. BERESFORD (*Idaho Sta. Circ. 70 (1932)*, pp. 14, figs. 11).—This circular reports one of a series of studies conducted by the station in cooperation with the Idaho Committee on the Relation of Electricity to Agriculture.

It has been found that V-belt drives for farm motors and equipment are efficient, flexible, and well adapted to most belt-driven farm machinery suited to electric motor power. High reduction or increased ratio drives are obtained with V-belts at a minimum expense and economy of space. The power transmission capacity of a multiple V-belt drive may be increased by addition of individual belts or strands. Combination V-grooved drives and flat-driven pulleys on portable farm motors and farm machines permit a convenient and satisfactory drive for reduced speed ratio needed on silage cutters, hay choppers, and similar machines. V-belts are not adapted to operation under temperatures above 120° F., or where oil or grease is prevalent.

Tractor and horse power in the wheat area of South Dakota, C. M. HAMPSON and P. CHRISTOPHERSEN (*South Dakota Sta. Circ. 6* (1932), pp. 39).—The data discussed in this circular, obtained in cooperation with the U.S.D.A. Bureau of Agricultural Economics, indicate that many farms in the wheat area of South Dakota are not operating their separate power units at their maximum efficiency. The low efficiency units are represented by the tractors which consume more fuel and oil per 10 hours than the averages, by the horses which are fed more than the average of other horses doing a similar amount of work, and by tractors and horses that perform less work per 10 hours than the most common performances. Even the averages are not to be considered the optimum of efficiency, since many teams and tractors do better than the averages, and since the averages include power units which were operated with less than their respective optimum loads.

The efficiency of tractors may be improved and the cash costs of operation reduced by making needed repairs and adjustments, by using proper hitches, by operating with an optimum load, and by good bargaining for fuel and oil. Efficiency of horses may be increased and the costs reduced by having harness and implements in best adjustment, by using proper hitches and loads, by economical feeding, and by using mostly young horses. Farm power costs may be further reduced by less threshing of feed crops and by harvesting more of the feed crops with livestock.

Many farms in the South Dakota wheat area do not have the best possible power combinations. Adjustments to secure such combinations frequently involve considerable changes in amounts of land, labor, and capital, and a period of several years. Increasing the crop acreage of farms would reduce the total costs per acre of the power units thereon, and on many farms the increase would make the power units more effective. If the added acreage could be secured with small cash outlay, the net returns to the farm might be enhanced also. A partial shift from the use of a large tractor to more use of a smaller one or a shift from tractor as major power to horses as major power would be desirable on some farms during periods of low prices for farm products. Net returns to the farm business over a period of years should determine any adjustments which would be effective for a long time. Under normal economic conditions net returns are of greater importance than the temporary lowering of cost per unit of power, per unit of land, per laborer, or per unit of product.

Information is also given on adjustment and utilization of farm power under conditions similar to 1932.

Comments on depreciation and repairs of combine harvesters and tractors on the Canadian prairies, E. G. GREST (*Sci. Agr.*, 13 (1932), No. 1, pp. 26-35).—An attempt is made in this brief contribution from the Canadian Department of Agriculture to develop a satisfactory method for the calculation of depreciation on combines and tractors in western Canada under average prevailing conditions of operation.

A note on the machines used in the testing of paddy for breakage in milling, A. HAYES (*Agr. and Livestock in India*, 2 (1932), No. 2, pp. 162-169, pls. 2, figs. 8).—Four machines are described and illustrated, including a seed mixer, a huller, a separator, and a rice pounder.

A new type of cotton sorter, E. H. PRESSLEY (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 2, pp. 89-98, figs. 4).—A new device upon which combed samples of unginned cotton may be sorted, developed at the University of Arizona, is described and illustrated with remarks on preparation of samples for sorting, some of the results obtained with the sorter, and its advantages.

Artificial drying of hay in Russia [trans. title], M. EVREINOV (*Elektrif. Selsk. Khoz.*, 1 (1931), No. 7, pp. 30-44, figs. 19).—The results of experiments on the artificial drying of hay by hot air blast through open stacks or stacks inclosed in tubes are reported. The hot air blast is gravity cleaned and has a temperature of from 90° to 100° C. The data are mostly of a service character but indicate the probability that the process is sound and economical.

Heating the soil by electricity [trans. title], A. TSEKULINA (*Elektrif. Selsk. Khoz.*, 1 (1931), No. 7, pp. 46-51, figs. 8).—The methods and equipment used in the electrical heating of soil under 2,200 coldframes for the germination of cotton plants are described and illustrated. The electrical current was conducted through a set of iron wires 12 to 15 cm below the soil which was supported on a wooden grill. Data on installation and operation are given, it being pointed out that the open iron wires are a source of danger.

Electrification of the poultry industry [trans. title], G. SHEKHALEVICH (*Elektrif. Selsk. Khoz.*, 1 (1931), No. 7, pp. 52-57, figs. 4).—Data are presented on the installation of electric light in poultry and brooder houses, on the use of ultraviolet ray treatment of poultry, electrical ventilation of poultry houses, electrical incubation, and electrical heating.

The development and use of roofing nails, A. J. DENISTON, JR. (*Agr. Engin.*, 14 (1933), No. 1, pp. 9, 10, fig. 1).—A brief description is given of different types of roofing nails together with recommended practice as to their use.

Deterioration of domestic chimneys, I, II, J. E. MACONACHIE (*Canad. Chem. and Metall.*, 16 (1932), Nos. 11, pp. 270-274, figs. 5; 12, pp. 292-295, figs. 4).—Studies conducted for 2 years at the Ontario Research Foundation are reported, in which special attention was given to the influence of flue gas condensation on chimney deterioration and the development of preventive measures.

A field survey of several cases of chimney deterioration and an analytical study of some of the products pointed to sulfuric and sulfurous acids arising from the condensation of some of the products of combustion as the chief causes of trouble.

Determinations of chimney temperatures and dew points indicated that in order to prevent deterioration, turbulence in the flue gas stream should be avoided. An acid-resistant coating could be successful, and would, in contrast to metallic linings, entail little installation expense. A search for a suitable material resulted in the selection of an asphalt and chromate emulsion that proved to be particularly well adapted to the purpose.

An appendix lists materials tested for protective coating purposes.

The septic tank, E. R. GROSS (*New Jersey Stat. Circ.* 267 (1933), pp. 4, figs. 3).—Practical information is given on the planning and construction of small sewage disposal systems for isolated residences. These include treatment by septic tank and tile absorption area.

AGRICULTURAL ECONOMICS

[**Investigations in agricultural economics at the Kansas Station, 1930-1932**] (*Kansas Sta. Bien. Rpt.* 1931-32, pp. 19-25).—Findings are briefly given regarding the estimated cost with different yields per acre of producing wheat in 1930 and 1931, farm grain storage facilities in the State, local elevator costs and business required for profitable operation, cooperative marketing by large-scale wheat producers, the seasonal fluctuations of the prices of wheat and the factors affecting such fluctuations, the movement of banking business from the strictly rural sections to the larger cities and from small to large

banks, the methods used by insurance, mortgage and loan, and trust companies in extending long-time credit to agriculture, the distribution of the poultry industry in the State, the relation of size of flocks to egg production and receipts, some factors affecting prices received for eggs, the decline in associations marketing livestock, the time at which and places where Kansas livestock and livestock products are marketed, and the factors influencing the time and place, and the present status of and marketing methods and practices, price-making factors, sources and character of competition, and seasonal variations in production in the fruit and vegetable industry of the State.

Current Farm Economics, Oklahoma, [February and April 1933] (*Oklahoma Sta., Cur. Farm Econ.*, 6 (1933), Nos. 1, pp. 20, figs. 4; 2, pp. 21-52, figs. 5).—Included in the first of these numbers are articles on the general agricultural situation and the foreign trade of the United States in relation to agriculture, by L. S. Ellis; the dairy and wheat situation, by P. H. Stephens; the receipts of sheep at the Oklahoma City markets, 1923-32, and the sheep and lamb situation, by R. A. Ballinger; the beef cattle and hog situation, by P. Nelson; and the potato outlook, by W. J. Green. Tables show (1) by years 1910-32 and for January 1932 and 1933, the indexes of farm prices in Oklahoma and the United States, of prices paid by farmers in the United States, wholesale prices in the United States, the Oklahoma corn-hog ratio, and demand deposits in Oklahoma; and (2) by years 1910-32 and months January 1932 to January 1933, the prices of different Oklahoma farm products, and the index of farm prices of such products and of the purchasing power of all crops, all livestock, and all products.

The April issue includes discussions of the general agricultural situation, by L. S. Ellis; of a long-time view of the competitive position of Oklahoma cotton producers, by J. T. Sanders; of the cattle and hog situation, by P. Nelson; of the wool and broomcorn situation, by R. A. Ballinger; of the economic consequences of the World War debts, by Z. B. Wallin; of the monetary reform in relation to farm relief, by P. H. Stephens; and of some immediate social problems facing Oklahoma agriculture, by O. D. Duncan.

[Investigations in agricultural economics at the Rhode Island Station, 1932] (*Rhode Island Sta. Rpt.* [1932], pp. 41-43).—Some results of studies are given showing (1) the relative average sales price, cost of grading, and net prices received for sized, graded, and labeled and for farmers' pack hothouse tomatoes in 1930 and 1931; (2) comparisons for 1928 and 1932 of the sources and size of purchases of eggs, kinds of eggs purchased, and type of container preferred in the same sections of Providence; and (3) the average costs for feed, labor, overhead, replacements, etc., and the credits in producing milk on 73 Rhode Island farms during February to April 1932.

Agricultural economics, C. S. ORWIN (In *Agricultural Research in 1930. London: Roy. Agr. Soc. England, 1931, pp. 60-80*).—Short summaries are given of the research work in England during the year 1930 in farm management, cooperation, and farm organization and agricultural policy. The scope and methods of research are discussed, and a list is given of publications during the year.

History and theory of agricultural credit in the United States, E. S. SPARKS (*New York: Thomas Y. Crowell Co., 1932, pp. XIII+476, figs. 3*).—This is a source and textbook for classes in agricultural credit and for general readers. Agricultural credit in the United States has been traced historically with a view of finding the various sources of rural credit and making possible a clearer insight into the principles of agricultural credit as they have developed from time to time. The first five parts deal with the early flows of

capital into frontier agriculture and foreign trade and the merchant, the land banks, other important agencies that furnish long-time loans to agriculture on land mortgages, commercial banking and agriculture, and intermediate credit institutions. The sixth part discusses the question whether the farmers in the United States are amply supplied with rural credit facilities, the status of farm debt in the United States, and the present and future credit needs of agriculture.

Most of the 33 chapters are followed by questions and topics for investigation and most of them by a selected bibliography.

[**Thirteenth, fourteenth, and fifteenth annual reports of the Federal Farm Loan Board, 1929-1931**], A. W. MELLON, O. L. MILLS, ET AL. (*U.S. House Represent.*, 71. Cong., 2. Sess., Doc. 212 (1930), pp. III+195, figs. 2; 3. Sess., Doc. 555 (1931), pp. III+180, figs. 2; 72. Cong., 1. Sess., Doc. 36 (1932), pp. III+158, figs. 3).—These reports continue the series previously noted (*E.S.R.*, 62, p. 283) and cover the operations of the Federal land banks, joint-stock land banks, and Federal intermediate credit banks for the years ended December 31, 1929, 1930, and 1931.

Nebraska farm mortgages, M. C. WEAVER (*Nebr. [Univ.] Studies in Business No. 30* (1932), pp. 50, figs. 2).—This includes the extent, purposes, and costs of farm mortgage debt and the length and methods of payment of loans in the State.

Between 1890 and 1930, the percentage of farm mortgages increased from 52 to 61, the debt per mortgaged acre from \$6.43 to \$21.62, and the combined value of land and buildings per acre from \$18.63 to \$55.81. The percentage of debt to value of land and buildings remained well within accepted limits of soundness, which were 50 percent of the value of the land plus 20 percent of the value of the buildings. The interest rate, which averaged 8.2 percent in 1890, dropped to 6.3 by 1915, and to 5.7 by 1920.

Research in agricultural insurance: Scope and method, J. D. BLACK ET AL. (*Social Sci. Res. Council Bul. 14* (1932), pp. [4]+63).—Agricultural insurance as a field of research is outlined in this report, which was prepared under the direction of the advisory committee on social and economic research in agriculture. The contributions were made by J. D. Black, S. B. Black, W. L. Cavert, C. H. Cyrus, H. Giese, J. A. Hodges, G. W. Hoffman, S. Johnson, H. Metzger, J. D. Pope, V. N. Valgren, and H. W. Yount.

Agricultural insurance is defined as all the different forms of insurance that are used or needed in connection with agricultural risks. Some of the forms enumerated are insurance on farm buildings and ordinary personal property against fire and lightning and windstorm and hail; farmers' automobile and truck insurance against theft, fire, windstorm, hail, collision, property damage, and public liability; livestock insurance against loss of animals by disease or accident; crop insurance against individual hazards such as hail or frost and freeze; broader forms of crop insurance against all or a stipulated variety of climatic, insect, and other hazards to which growing crops are exposed; employers' liability insurance; life insurance; and health and accident insurance for farm people.

Included are discussions of basic principles and concepts, a brief history of research in agricultural insurance, sources of data, and outlines and analyses of research projects in this field. These illustrative projects are divided into three groups. Group A includes 3 projects selected from the point of view of the insured; group B includes 12 projects selected from the point of view of the type of risk and the agencies handling it; and group C includes 4 projects,

miscellaneous in character, including relative advantages and disadvantages of insurance provided by different types of agencies, hedging as a form of price insurance, possibilities and problems involved in flood insurance, and case analysis of individual insurance companies.

This report is designed to be of specific help to research specialists and administrative officers in the development of projects in agricultural insurance.

World agriculture: An international survey (*London: Oxford Univ. Press, 1932, pp. [VII]+314, fig. 1*).—In this report by a study group of members of the Royal Institute of International Affairs, world agriculture is surveyed from the following viewpoints: Production and consumption; international trade in agricultural products; modern methods; returns from agricultural enterprise; price movements; aspects of the price fall; national aims and conditions in agriculture overseas, in Europe, Asia, and the Tropics; tariff action by individual States and by groups of countries; organization of agricultural producers for trade purposes; and international associations representing agricultural interests.

The conclusion is reached that increases in production are, by themselves, insufficient to account for the present price fall, and that the depression is primarily due to diminished purchasing power resulting from the breakdown of international exchange. The hope is expressed that the forthcoming World Economic Conference may promote world recovery and enable farmers to extricate themselves from their present plight.

Appendix 1 carries extracts from the data gathered, appendix 2 is a summary statement of the Ottawa agreements, and appendix 3 discusses direct relations between producers' and consumers' cooperative societies.

The agricultural crisis, Vol. II (*Genève (Geneva): League of Nations, Econ. Com., 1931, pp. 113, figs. 3*).—This second volume (E.S.R., 66, p. 285) is divided into two parts. Part 1 contains studies on the position of agriculture in Canada, China, Colombia, Egypt, Portugal, Turkey, and the Union of Soviet Socialist Republics. Part 2 contains reports on the spread between the prices paid to the producers and the prices paid by the consumers in Austria, Finland, Germany, Hungary, Netherlands, Norway, Poland, Rumania, Spain, Switzerland, and the United States.

An economic survey of Australia, edited by D. B. COPLAND (*Ann. Amer. Acad. Polit. and Social. Sci., 158 (1931), Nov., pp. [V]+281, figs. 19*).—The main object of this volume is to offer a survey of recent trends in Australian economic development. The contributors were requested to deal with developments up to the depression beginning in 1929. The 31 articles cover the population and economic resources, trends in production and trade, industrial organization and economic control, labor and industrial relations, public finance and State enterprise, and politics and industry—stock taking.

The following articles deal quite largely with agriculture: Sketch of Economic Geography (pp. 1-8), Growth of Population and Immigration Policy (pp. 9-17), Occupations and Urbanisation (pp. 18-25), and Survey of Production and the National Income (pp. 26-30), all by G. L. Wood; Land Utilisation (pp. 31-39), The Pastoral Industries (pp. 40-48), The Wheat Industry (pp. 49-57), and Dairying and Other Rural Industries (pp. 58-65), all by S. M. Wadham; The Export Trade and Imperial Preference, by R. Wilson (pp. 86-94); Marketing Organisation, by A. G. Whitlam (pp. 111-118); The Tariff—Its Costs and Effects, by L. F. Giblin (pp. 119-132); and The Possibilities of Scientific Research, by A. E. V. Richardson (pp. 251-258).

Agricultural regions of North America.—Part X, The grazing and irrigated crops region (Continued), O. E. BAKER (*Econ. Geogr., 8 (1932), No. 4,*

pp. 325-377, figs. 39).—This is a continuation of the article previously noted (E.S.R., 66, p. 881).

Recreational and forestry uses of land in Massachusetts, D. ROZMAN (*Massachusetts Sta. Bul.* 294 (1933), pp. 20, figs. 7).—The changes in agricultural land utilization from 1880 to 1930 are traced. The extent of nonresident ownership and the relation between it and land in farms, improved land in farms, farm land values, elevation of land, and utilization of land especially for recreational purposes; State, town, and other public or semipublic forests; and possibilities of extending public ownership of lands are discussed.

The area in farms and number of farms in the State declined from 3,360,000 acres and 35,406 farms, respectively, in 1880 to a little over 2,000,000 acres and 25,599 farms, respectively, in 1930. The improved acreage in farms declined nearly two thirds. About one third of the total area in towns with less than 10,000 population is now owned by nonresidents. The greatest increase in the abandonment of farm lands and in nonresident ownership has been in the hilly and poor farm land sections. Except in coastal towns and in a few towns in Berkshire County the development of recreational uses has not encroached upon the farm land. The development of recreational uses in communities with large idle land areas has benefited the local conditions by increasing tax returns, local markets for agricultural products, and by providing some employment for local people. In some cases a negative effect was found due to the lack of interest in local institutions and competition for farm labor. Future development of good roads will result, it is believed, in a considerable amount of the idle land being used for part-time farming, recreational, and residential purposes, but the major portion will have to be used for growing trees.

Programs for land utilization in the towns and sections should be based on careful study of local conditions. It is suggested that in the acquisition of land by the State or other public institutions for forestry or recreational purposes (1) towns should not be included in which the improvement of present roads and the construction of new roads are likely to create a considerable development of part-time farming and summer homes in the near future, and (2) in towns having a major portion of the land abandoned it may be advisable to convert the entire town into a State forest by arranging for the exchange of lands in adjoining counties for lands now occupied for farming.

An economic study of Sumter County agriculture, W. C. JENSEN, B. A. RUSSELL, and M. GUIN (*South Carolina Sta. Bul.* 288 (1933), pp. 72, figs. 13).—This bulletin reports the results of a study made to determine the extent to which the farmers can advantageously supply their local markets and to find the most profitable crop and livestock enterprises for the county. The survey method was used in gathering the data, and complete farm records for 1931 were obtained from 120 white and 68 negro families and special production records for 1932 from 50 white farmers. Data were also obtained from wholesale and retail grocers, housewives, boarding houses and restaurants, railroads, trucksters, hucksters, etc., and 200 records of other studies in the State were used. The people, labor, land, systems of farming, size of farms, rural credit, industry and trade, and transportation of the county are described. Analysis of the records covers the organization, size of farm, financial management, receipts, expenses, and income of the farms, farm practices, quantity inputs, costs of production of different crops and kinds of livestock, and the marketing and consumption of livestock, dairy, poultry, and field crop products, fruits, and vegetables.

The results on standard farms and with standard enterprises, special types of farms and new enterprises, operation of negro farms, marketing standards,

possible production of local market deficits, food consumption per family on the white and negro farms, and the consumption of specified fruits, berries, vegetables, and livestock, dairy, and poultry products per adult equivalent in white and negro families in the city of Sumter, grouped into families of low and medium to high purchasing power, are discussed. The 1933 outlook, the long-time outlook, and the 10-year development program are also considered.

Farm production costs in Oklahoma, 1931, P. H. STEPHENS (*Oklahoma Sta. Bul.* 208 (1933), pp. 56, figs. 8).—The findings in a study made in cooperation with the Bureau of Agricultural Economics, U.S.D.A., are reported. Data regarding the farm business were obtained for over 200 Tillman and Washita County farms in the cotton areas of the southwestern part of the State for 1929 and from 87 of the Tillman County farms for 1931. The cooperation of 61 farmers in Garfield County—a north-central county—and of 53 farmers in Craig and Mayes Counties—northeastern counties—was secured in the fall of 1930 in keeping farm account books and supplying data on crop and livestock production requirements. The general conditions existing in 1931 as regards weather, prices, and wages are described.

Tables are included and discussed showing for the northeastern and north-central counties the monthly distribution of man labor on livestock; quantities and costs of feeds fed per dairy cow, cost of butterfat production, sources of income on dairy farms; number of man hours per cow for different size herds; effect of pounds of concentrates fed per cow on production and cost of butterfat and returns per man hour; relation of butterfat production per cow to cost of production; returns per man hour and profit per cow; cost of poultry production; monthly distribution of egg production and value of eggs; tractor operation costs; horse work costs; maintenance cost of automobile or truck, combines, field machinery, and buildings other than residence; costs of operating combine; and itemized costs per bushel and net profit per acre in producing wheat, oats, barley, corn, kafir, soybeans, and alfalfa hay. The farms in some cases were grouped as horse, tractor, and horse-tractor operated farms. Other tables show for cotton in the southwestern counties for the years studied the man labor, horse work, tractor operation, and machinery costs, and the total costs and net profits per acre.

Tests of farm organization in the Turlock area, R. L. ADAMS and L. A. CRAWFORD (*California Sta. Bul.* 544 (1932), pp. 128, figs. 9).—"The purpose of this publication is to present in detail a method of making an intensive business analysis of various types of farm organizations to determine the present earning power and to test proposed changes in the existing plan of organization as these affect the earning power of the farm."

The area selected for study and its agriculture are described. The plan of procedure consisted of an account of the type of business, total acreage, net acreage in crops, utilization, farming practices, yields, and disposition of the products; a list of the necessary investment items and their costs or value; a statement of kinds and amounts of products, reported as gross, reserved for farm or home use, and net for sale; the preparation of a calendar of operations; a statement of production and maintenance outlays required for different crops and dairy and poultry products; and a financial statement drawn up to show the value of production and cost of various expenditures, and to indicate the resulting net farm income.

The types of farm organizations tested were (1) a 40-acre field-crops farm with alternative plans under conditions of (a) changes in the selling prices of products, (b) an increase in yields, (c) an increase in the size of farm, (d) the addition of a 10-cow dairy, and (e) the addition of a 500-foot poultry plant;

(2) a 40-acre fruit farm with alternative plans with changes in selling prices, increase in yields, the addition of a 500-fowl poultry plant, the selling of dried fruit instead of fresh fruit, and a 20-acre unit instead of 40 acres; (3) a 40-acre truck farm to determine the prices necessary to provide a net farm income of \$1,800, to note the effects of increasing yields, and to compare the relative incomes when sweetpotatoes were substituted for cantaloups, and to determine the effect of increasing the size of farm and the possibility of adding a live-stock enterprise; and (4) a 40-acre dairy farm to determine the effect upon earnings of larger production per cow, changes in selling prices of dairy products, increased crop yields, and the effect on net income of selling manure and reducing overhead expenses.

An economic survey of the incomes, expenses, and taxpaying abilities of farmers on lands in the Merced Irrigation District, California, M. R. BENEDICT (*California Sta.*, 1933, pp. [6]+195, pls. 2, figs. 5).—This is a mimeographed preliminary report of a survey requested by the board of directors and committees of landowners and farmers and bondholders of the district as a result of the current or prospective inability of the district to meet in full the payments of interest and bonds due or maturing. An appendix includes copies of the forms used in the survey.

A method of determining what to produce, B. HUNTER and P. A. EKE (*Idaho Sta. Bul.* 195 (1932), pp. 48, figs. 7).—The major purpose of this bulletin, prepared in cooperation with the Bureau of Agricultural Economics, U.S.D.A., is "to present a method of studying the agriculture of an area and the business of individual farms." This bulletin applies especially to the "deep soil phase" of the Twin Falls south side irrigation project.

The area and the changes in livestock, 1914–29, and in uses of land, 1913–29, are described. Tables of production standards, prices, and costs based on data for the years 1922–29 and 1931 are given and used in outlining 11 plans for operating an 80-acre farm. Tables are given and discussed, showing for the 11 plans the crop rotation and crop acreage, estimated number of livestock, estimated amount of hired labor, production of different crops, kinds of livestock and disposal thereof, capital, receipts, expenses, and labor income. Comparisons are made of the different plans and the farm income with different prices for products, and the making of a budgeting program for an individual farm is discussed.

An economic study of broomcorn production, R. S. WASHBURN and J. H. MARTIN (*U.S. Dept. Agr., Tech. Bul.* 347 (1933), pp. 42, figs. 9).—This bulletin, prepared by the Bureaus of Agricultural Economics and Plant Industry in cooperation with the State experiment stations of Illinois and Kansas, describes and discusses the changes in areas and quantity of production and in prices of broomcorn, the exports of broomcorn and brooms, the relation of supply to price, acreage needed to supply the demand, cost of production and returns, and the choice of competing cash crops. The usual field practices, the practices that should increase profits, and the costs of production in Illinois, Kansas, and Oklahoma are also described.

The annual production of broomcorn in the principal producing States, 1925–1931, varied from 31,200 to 54,700 short tons. The demand for domestic use averaged about 45,500 tons and that for export about 4,500 tons. A change of approximately 10,000 short tons from the average requirements, 1923–24 to 1931–32, resulted in a change of about \$15 per ton in price from that of the preceding year. Costs of production in 1928 in Illinois, Kansas, and Oklahoma ranged from \$91 to \$136 per ton, of which cash costs represented approximately 50 percent. The 5-year average yields for the districts studied

ranged from 295 to 583 lb. of brush per acre, of which from 274 to 488 lb. were required to pay costs, including interest. On the basis of average production and prices, broomcorn appears to have had a slight advantage over corn in Illinois. The net returns from milo in Kansas and from cotton in Oklahoma were slightly greater than those from broomcorn.

Supply, demand, and prices of California peaches, H. R. WELLMAN (*California Sta. Bul.* 547 (1932), pp. 64, figs. 23).—This bulletin supersedes the circular previously noted (E.S.R., 55, p. 688). The general conditions in the peach industry, including the production in the main peach-producing areas of the United States and in different countries and the utilization of the United States and California crops, are described. Analysis is made of the situation in the United States, and especially in California, in the canned, dried, and fresh peach industries, including the trends in production, acreages, demand, prices, exports, foreign competition, competition of other fruits, etc.

The enormous increase in the production of clingstone peaches, used mainly for canning during the past decade, resulted in a marked downward trend in the prices to both canners and growers. From 1921 to 1926 the demand increased rapidly but was offset by the increased production. Since 1929 the decline in purchasing power of consumers and in the general price level, the less rapid decline in the cost of production and canning, reduced exports, increased competition of Australian peaches in the United Kingdom market, etc., have resulted in reductions of demand, of prices to canners and growers, and of wages to both farm and cannery labor. The lower prices have resulted in a cessation of plantings, the removal of trees, and the neglect of orchards, so that production is now declining, and it is thought that the surplus situation will be corrected eventually.

The production of freestone peaches, used chiefly for drying and fresh fruit shipment, has declined. The output of dried peaches and shipments of fresh peaches have remained at approximately the same level as in former years. Prices of dried peaches have not shown a downward trend during the last decade, and with the prospects of a further downward trend in production, the industry is likely to be in a favorable position when consumers' buying power increases. Production and shipments of fresh peaches increased rapidly up to 1926. Since then there has been a gradual decline, and the trend will probably continue downward for several years. It is expected that during the coming years eastern markets will afford an outlet for a substantially larger volume of California fresh peaches than in 1931, a year of large crops in competing States.

Wool survey: A summary of production and trade in the Empire and foreign countries ([*Gt. Brit.*] *Empire Marketing Bd.* [Pub.] 57 (1932), pp. 221, pls. 10).—This, the first of two reports setting forth the results of a statistical survey by the Empire Marketing Board of the world production of and trade in wool, deals with the sheep population and production and export trade in raw wool, by countries; prices of raw wool; and miscellaneous animal fibers.

[Second and third annual reports of the Federal Farm Board] (*Fed. Farm Bd. Ann. Rpts.*, 2 (1931), pp. VII+95, figs. 8; 3 (1932), pp. III+110, figs. 7).—These reports continue the series previously noted (E.S.R., 64, p. 567) and cover the operations of the board for the years ended June 30, 1931 and 1932. Each report discusses the developments in cooperative marketing; surplus control methods, including stabilization operations, for wheat and cotton; production adjustments; and the organization of the board. Tables are also included relating to the board's loan operations.

Cotton marketing (*Georgia Sta. Rpt. 1932, pp. 25-27*).—A table is included showing by years 1929-32 the distribution by staple lengths of cotton ginned in Georgia prior to November 1.

Memorandum on Empire sugar policy for submission to delegates to the Imperial Economic Conference, Ottawa, 1932 (*London: Sugar Fed. Brit. Empire, 1932, pp. [2]+36*).—This memorandum submitted by the Sugar Federation of the British Empire to the Imperial Economic Conference held at Ottawa, Ont., in 1932, includes suggestions for a coordinated policy for sugar throughout the British Empire. Appendixes include a list of the members of the federation; a table showing the duties and preferences on sugar in all parts of the Empire, July 1, 1932; a statement of the State aid and subsidies accorded in the United Kingdom, Australia, South Africa, and Jamaica; tables showing the imports from and exports into countries of the Empire of raw and refined sugar; a memorandum to the Chancellor of the Exchequer in January 1932; and a table showing the duties on sugar manufacturing machinery in different countries of the Empire.

The voluntary domestic allotment plan for wheat, J. S. DAVIS (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 9 (1932), No. 2, pp. [2]+23-62*).—This plan is described as launched upon the social assumptions that there is normally a balance between agriculture and industry, that it is now disturbed in a manner unfavorable to agriculture, and that agricultural recovery is a prerequisite to general economic recovery. The author raises the question whether these assumptions are entirely sound and whether social science as yet affords much foundation for social engineering. The plan is commended for the fact that it would not be likely to stimulate exports or excite retaliation and for its acreage-restriction features. Some questions are raised, however, as to whether commercial mills would run the risk of losing business through reduced flour consumption or processing in channels that could evade the tax on domestically consumed wheat. Acreage restrictions might not, in themselves, control production and might be weakened by frequent adjustments of the allotment basis or by lax enforcement. Difficulties might also be encountered in determining just when particular commodities and individuals were entitled to participate in allotment benefits.

Attention is called to the possible effects of a tax on consumption, which in the case of flour might amount to \$2 a barrel. Between the date of assured prospect of the passage of an act and the actual imposition of the tariff adjustment charge, buyers would be enabled to stock up, and these stocks would probably affect subsequent wheat purchases and prices.

The question is also raised whether the substantial transfer of purchasing power from consumers to farmers is socially justified. The plan is characterized as possessing attractive features but involving major experiments in which its complications should not be minimized or its promise exaggerated.

Organization of wheat trade in the north-western region, United Provinces, T. PRASAD ([*United Provs. Agra and Oudh, Dept. Agr.*] *Bul. 51 (1932), pp. [XI]+60, pl. 1*).—This is a survey of the marketing organization and methods in the upper portion of the Ganges-Jumna doab in India. The findings are discussed in chapters on the distribution of markets, communications and transportation, methods of agricultural finance, the chain of middlemen, speculation, and storage. Some suggestions are made as to means of reducing costs of marketing and stabilizing prices.

The physical volume of production in the United States, G. F. WARREN and F. A. PEARSON (*New York Cornell Sta. Mem. 144 (1932), pp. 72, figs. 43*).—Tables and charts are included and discussed showing the annual index numbers (1926-30=100), 1839-1932, of population, and of the physical volume of

production and the physical volume of production per capita of food and feed crops, total crop production, forest products, electric current, water power other than electric, coal, other fuel, fuel and power, other minerals, secondary metals, other minerals and secondary metals, all minerals and power, and total basic production with constant group weights, with constant group weights weighted by value plus value of manufacture, with variable group weights, and with variable group weights weighted by value plus value of manufacture. Other tables and charts show the rate of change of the index numbers during different periods of years and the index numbers of building construction in the United States, 1899–1932. Still other tables and charts show the index numbers of production of wheat, corn, and cotton, their relation to prices and to production of all crops in the United States and to world production.

The methods used in calculating the several indexes are discussed. Tables show Snyder's measures of physical volume of basic production, 1865–1931; Persons' index numbers of physical production in the United States, 1860–1930; and the equations of rates of change based on the authors' index numbers of physical volume of production and of physical volume of production per capita.

Research in marketing of farm products: Scope and method, J. D. BLACK ET AL. (*Social Sci. Res. Council Bul.* 7 (1932), pp. [6]+221, figs. 2).—This is one of a series of publications on scope and method in the several subfields of agricultural economics and rural sociology. Marketing as a field of research is discussed by J. D. Black and the history of research in marketing and current trends by H. B. Price and J. M. Cassels. Some 40 agricultural economists are listed as contributors to the report.

Researches in the several phases of the subject are treated under 9 group headings. Group A contains 7 typical projects relating to the structure of markets and market areas; group B, 8 projects, the consumption basis of the marketing of farm products; group C, 3 projects, market outlets; group D, 12 projects, the organization of marketing business units; group E, 11 projects, business unit operations; group F, 6 projects, government participation in marketing; group G, 5 projects, marketing institutions; group H, 3 projects, general projects by commodities; and group I, 11 projects, miscellaneous. The relation of particular projects in marketing to research in other subfields of social and natural science research is recognized.

Crops and Markets, [March 1933] (*U.S. Dept. Agr., Crops and Markets*, 10 (1933), No. 3, pp. 81–112, figs. 3).—Besides the usual market reports and price situation data, information is given regarding planting intentions as of March 1, 1933, for different crops; acreages, by States, of different crops harvested in 1931 and 1932 and indicated for harvest in 1933; and estimated prices, by States, of different farm products, February 15, 1932 and 1933.

Wholesale prices for 213 years, 1720 to 1932, I, II (*New York Cornell Sta. Mem.* 142 (1932), pp. 222, figs. 39).—Part 1, Wholesale Prices in the United States for 135 years, 1797 to 1932, by G. F. Warren and F. A. Pearson (pp. 5–200), presents the results of a study, the aim of which was “to present comprehensive index numbers to correspond with the present index numbers of the U.S. Bureau of Labor Statistics.” Index numbers are given for 11 groups of commodities—farm products, foods, hides and leather, textiles, fuel and lighting, metals and metal products, building materials, drugs and chemicals, house furnishings, miscellaneous, and spirits. For the years previous to 1797, the prices obtained in part 2 were used. For the period 1880 to 1889, from 113 to 146 commodities were used, there being 116 in 1800 and 138 in 1889. For 1890 and later years, the index numbers of the Bureau of Labor Statistics, converted to the 1910–14 base, were used for the first 10 groups, and an index number was computed for spirits. A section (pp. 120–167) on the technical

details of construction of the index numbers includes descriptions and discussions of the methods of weighting of the commodity groups and of the commodities within the groups, the quantities of different commodities entering into the commerce of the United States, the methods of tabulating prices and of making computations, and the test weights used. Prices in different countries; the value of gold in England; currency price of gold in London; prices of individual commodities as compared with the general price level; and the effects of declining commodity prices on the building industry, losses on inventories, debtors, fixed charges, wages in general, unemployment, farm wages, efficiency in the use of labor, amount of farm products required to pay for a month's labor, farm management, distributing charges, the importance of marketing, and legislation are discussed. The world monetary stocks of gold and the relation of such stocks and the world physical volume of production to prices in England, United States monetary stocks of gold and the relation of such stocks and the United States physical volume of production to wholesale prices in the United States, efficiency in the use of gold, and future relationships of gold to prices are also discussed.

The tables and charts included show, among other things, the monthly index numbers of wholesale prices of all commodities with variable group weights, 1720-1932; comparison of such prices in the War of 1812, the Civil War, and the World War periods; comparison of prices in the United States with those in France and China, 1913-32; comparative price declines (or increases) from peak years to 1929 and to November 1931 in the United States, England, France, Italy, Germany, and North China; monthly index numbers of prices in England, 1885-1932, and in France, 1901-32; index numbers of wholesale prices in England, 1782-1931, and comparison of such prices during the Napoleonic and World War periods; comparison of prices in gold and in currency and value of gold in England, by years 1782-1932; currency price of gold in London, by years 1798-1821, and by months 1910-32; average monthly exchange rates on London, 1912-32; comparison of wholesale prices of all commodities in the United States and prices of hogs at New York City, 1860-84, of heavy hogs at Chicago, 1914-32, of winter wheat at New York City, 1860-84, of No. 2 hard winter wheat at Kansas City, 1914-32, and of wages, exclusive of agriculture, in the United States, 1860-90; comparison of prices of white pine and brick, 1860-91, and of yellow pine and brick, 1914-32, of rents in 5 large cities, 1860-80, and in 8 large and 10 lesser cities, 1914-32; purchasing power of hourly wages, exclusive of agriculture, 1840-1929; wholesale prices and percentage of unemployment in Great Britain, 1888-1932; comparison of wholesale prices and wages in England, 1790-1855; farm wages in different States of the United States, 1910-32; amount of wheat, milk, and eggs required to pay one month's cash wages and board in New York during different periods, 1880 to 1929; labor income, 1908 and 1928, on northern Livingston County, N.Y., farms with different crop indexes and work units per man; monthly index numbers, 1910-32, of prices paid farmers in the United States for food, of retail prices paid by consumers for food, and cost of distributing food; changes in prices of basic commodities in periods of rising and declining prices; relation between monetary stocks of gold and the physical volume of production and wholesale prices in England, 1839-1931, and in the United States, 1839-1932; and monetary gold, money in circulation, and bank deposits in the United States, 1880-1932.

Other tables and charts show the monthly index numbers, 1797-1932, of wholesale prices of all commodities with constant group weights and compare them with those with variable group weights and with those of 30 basic commodities; currency value of gold in the United States, by months 1814-17, 1837-43, and 1862-78; gold value of currency in the United States, by months

1862-78; and the monthly index numbers of wholesale prices in the United States in gold, 1862-78, with variable and constant group weights and of basic commodities.

Tables show the monthly and yearly index numbers from 1785 to 1798 to 1932 for each of the 11 commodity groups and for farm foods. Charts compare the index numbers, except for house furnishings, with those for all commodities. Other tables show for the period 1860-71 the monthly index numbers of wholesale prices of farm products and of basic commodities with cotton at full weight, and the monthly index numbers of wholesale prices of lumber, 1797-1932.

Comparisons are made of the several index numbers calculated by the authors in this study with the following index numbers: The Aldrich simple-average index; Snyder's index of wholesale prices of 14 basic commodities, 1860-1926; Cole's index of wholesale prices of 33 commodities, 1843-62, and of 38 commodities, 1825-45; Smith's index of wholesale prices of 33 commodities in Boston, 1795-1824; Roelse's index of wholesale prices, 1791-1801; an unweighted quarterly 20-commodity index calculated by the authors, 1843-91; a weighted quarterly 37-commodity index computed by the authors, 1840-91; a 147-commodity index computed by the authors, 1840-1930; and the index numbers of McNeil, Mitchell, Dun, Snider, Hurlin, and Juergens, the U.S. Bureau of Labor Statistics, and others. The computation of the several indexes, the weightings, etc., are discussed, special attention being given to the period 1840 to 1890. A bibliography is included.

Part 2, Wholesale Prices at New York City, 1720 to 1800, by H. M. Stoker (pp. 201-222) presents a series of index numbers calculated from quotations published in New York City and Philadelphia newspapers. The base period chosen was 1798-1800. The index numbers on this base were converted to the 1910-14 base to conform to those presented in part 1. Other index numbers included are a 71-commodity index for 1787-1800, and a 15-commodity index for 1720-87. The weightings of the several commodity groups and of the individual commodities in the groups are shown, discussed, and compared with the Warren and Pearson index numbers presented in part 1. Comparisons are also made of the indexes, 1720-1800, for New York City prices and the index numbers of G. R. Taylor for Charleston, S.C., Warren and Pearson and Roelse for Philadelphia, and W. B. Smith for Boston. The depreciation of currency during the period, and the agricultural development and trade of Colonial New York are described.

Price fixing in New Zealand, W. B. SUTCH (*Thesis, Columbia Univ., New York, 1932, pp. 165, figs. 4*).—"This survey covers the history of the war and postwar authoritative price-fixing and commodity control in New Zealand—its effects and effectiveness." The several chapters deal with the principles of commodity control, the control of sugar, butter, building materials, and wheat, and briefly with other commodities, including hides, footwear, petrol, potatoes, coal, milk, meat, bacon and ham, and groceries.

Appendixes describe the New Zealand legislation authorizing commodity control and compare the index numbers of controlled products. A bibliography is included.

Farmers' cooperative associations in Florida, H. G. HAMILTON and M. A. BROOKER (*Florida Sta. Rpt. 1932, pp. 25-27*).—Tables are included showing the number of associations of different types active and inactive in 1929-30, with the reasons given for 129 associations for ceasing to operate.

Agricultural co-operation in Scotland and Wales (London: George Routledge & Sons, 1932, pp. XI+246).—This volume, the third in the series (E.S.R.,

63, p. 888; 68, p. 555), completes the exhaustive survey of agricultural cooperation in the British Isles made by The Horace Plunkett Foundation. The first part (pp. 1-174), dealing with Scotland, traces the history of cooperation and discusses the legal position of the movement; cooperative societies handling agricultural requirements and eggs; cooperative creameries; the Scottish Milk Agency; cooperative marketing of wool, livestock, meat, bacon, potatoes, raspberries, and fish; sheep stock clubs; and societies undertaking services. The second part (pp. 175-246), dealing with Wales, traces the history of cooperation and discusses agricultural requirement societies and cooperative organizations for marketing and undertaking services.

Both sections include a detailed survey, by counties, of the existing organizations.

RURAL SOCIOLOGY

Research in rural organization: Scope and method, edited by J. D. BLACK (*Sociol Sci. Res. Council Bul.* 12 (1933), pp. 160, fig. 1).—This report was prepared under the leadership of a special advisory committee consisting of Black, C. C. Zimmerman, E. deS. Brunner, B. L. Hummel, J. H. Kolb, C. E. Lively, D. Sanderson, and H. R. Tolley. The twelfth in the series on scope and method, this publication represents the joint efforts of some 25 of the more experienced specialists in agricultural economics and rural sociological research in the United States. Preliminary to project analysis, rural organization as a field of research and the theoretical basis of such research are discussed by Black and Zimmerman. The latter also discusses the history of research in rural organization.

The type projects developed are divided into four distinct groups. Group A embraces 14 projects dealing with area and ecological organization; group B, 18 projects dealing with special-interest and related organizations; group C, 9 projects dealing with relationships of organizations to institutions and social environment; group D, 9 projects dealing with general and miscellaneous subjects, such as isolated-farm v. farm-village organization, unutilized human resources of an area, effects on social organizations of the commercialization of agriculture and the intrusion of urban residence into farming districts, the social significance of part-time farming, and utilization of leadership in social organizations.

This report is designed to be of service to administrative heads and specialists dealing with research in agricultural economics and rural sociology in the United States.

Rural social trends, E. DE S. BRUNNER and J. H. KOLB (*New York and London: McGraw-Hill Book Co., 1933, pp. IX+386, figs. 20*).—This is one of a series of monographs published under the direction of the President's Research Committee on Social Trends. The authors made a comprehensive survey of social changes which are proceeding simultaneously and interacting upon each other to an undetermined degree. They express the view that social problems arise largely from such unplanned reactions of the rapidly changing phases of social life upon the more stable phases. Among examples pointed out are changes in industrial technic which affect employment and changes in immigration policy which affect the growth of population and the demand for farm products.

The twelve chapters treat of the mobility and changing characteristics of rural population, country life and agriculture, village growth, country-village and rural-urban relationships, merchandising and credit services, the public school and education, religious agencies and services, social and recreational

organizations, rural social services, social implications of local government, and a forward-looking chapter on 1930 and after.

In six appendixes are presented the history and scope of the study, source data on rural and village population and rural-urban relations, case studies of tendencies regarding neighborhood changes, data on village and open country churches, source data on other social institutions, and social utilities and wealth.

The authors endeavor to present a clear picture of the American rural community in 1930, to contrast it with earlier conditions, and to offer suggestive explanations or interpretations of those changes that were found. The view is expressed that if men and women of all shades of opinion can find a common basis of knowledge to build upon, future social changes may be brought in large measure under the control of social intelligence.

The rural community: The natural history of a sociological group, D. SANDERSON (*Boston and London: Ginn & Co., 1932, pp. IX+723, figs. 57*).—This is a sociological study of the rural community. The object was to secure a knowledge of the forces and principles influencing the formation, persistence, and decline of various types of rural locality groups. Communities of different times and regions are classified according to structure and function into the primitive agricultural village, the village community, the modern agricultural village, and the modern rural community types.

The author traces the history, structure, economy, political organization, social institutions, social control, and causes of decline of the village community. The latter part of the book deals with the modern agricultural village and rural community, including social organization, attitudes, and control. In concluding chapters the future of the rural community and its sociological significance are developed.

Some conclusions reached are as follows: (1) The problem of the rural community group is one of both internal and external adaptation, of adjusting itself to existing environment and readjusting itself to ever new environment, to re-create environment to meet unsatisfied desires through communication, discovery, invention, science, art, and religion. The process is ever recurring and never completed. (2) The locality group as a mode of human association combines the factor of physical environment with that of human nature. (3) The modern rural community has less unity of the common will than has the village community. An advantage of the modern over the primitive village community, however, is that its common will is more potent and creative, whereas that of the village community was directed toward the maintenance of the status quo. (4) The rural community group is essential to human society. Vocationally, the farmers are attached to the land. Those who move are less likely to succeed. Acquaintance and the development of common interests in a local area are inevitable. (5) The environmental areas in which human association is frequent and intimate are greatly modified and extended with modern means of transportation and communication. The ties of history and tradition in a rural community tend to be stronger than in special interest associations. (6) The rural community acts collectively for purposes of defense. With progress the objects of defense necessarily change. Defense of the primitive village against attack of neighboring tribes, robbers, or wild animals becomes collective action against economic and social inequities and injustices in the modern rural communities. (7) No community can permanently exist without having available within the locality certain services which are essential to its life. Increased wants and greater division of labor call for larger areas for the support of highly specialized and occasional services and widen the area of the rural community. (8) The desire of the people

for sociability, recognition, and response forms a bond of the rural community. This calls for common meeting places for purposes of association within a local area. (9) For reasons indicated, the rural community becomes the most important group for social control, with the possible exception of the family. Because of interrelated interests, the rural community is both a primary group of individuals and a complex of voluntary associations. The form of the rural community changes but not the necessity for social organization of an agricultural people.

South Dakota town-country trade relations, 1901-1931, P. H. LANDIS (*South Dakota Sta. Bul.* 274 (1932), pp. 47, figs. 14).—This study, made in cooperation with the Bureau of Agricultural Economics, U.S.D.A., is based upon Bradstreet's Commercial Ratings for each fifth year, 1901 to 1931, inclusive, supplemented by Federal and State census reports, data from State departments, and correspondence with commercial firms.

Maps, tables, and graphs are included dealing with such factors as the normal annual precipitation; density of population; distribution of trade centers; number of mercantile enterprises of different kinds; percentages of rural and urban population; number and percentage of chain and independent units in trade centers of different sizes; and the relation of population to trade centers, retail stores, and chain stores.

Some of the implications of the findings of the study are as follows: (1) The farmer can, within limits, choose his trade center, and if he desires the small center his patronage is necessary; (2) if the small town disappears as a shopping center, there is danger it will also disappear as a market; (3) as the farmer participates more fully in urban modes of life, the farm home as a self-sustaining and self-determining economic and social unit declines, and it shifts its functions to the urban trade center; (4) in the absence of rural patronage, the crossroad general store will disappear, except where transient trade in gasoline and confectioneries supports it; (5) merchants must recognize the fact that the farmer now has a choice of trade centers and that trade is dependent on cultural and psychological factors as well as on neighborhood relations; (6) large towns and cities will probably supersede small towns to quite a degree in eastern South Dakota unless the small town can offer advantages that appeal to the new rural values; (7) different types of business units succeed best in different size trade centers; (8) merchants, by advertising, can radically change life habits and thus increase contacts between town and country; (9) probably the most successful trade center today is the one keeping its interests and wares before the tributary population continually by the use of the press, radio, etc.; and (10) the deflation of the farm income has dealt the rural trade center a stunning blow, prohibits the farmer from exercising many of his acquired buying habits, and is causing many farm families to return temporarily to a greater simplicity in living habits, which, if prolonged, means ruin for many merchants. This situation is bringing about a realization by both farmer and tradesman that the town is the farmer's town.

[**Papers on rural sociology presented at the twenty-sixth annual meeting of the American Sociological Society**] (*Amer. Sociol. Soc. Pub.*, 25 (1931), No. 4, pp. 3-64).—Included are the following papers presented in the rural sociology section at the meeting held at Washington, D.C., December 28-30, 1931: Proposed Method for Studying the Farm Family, by E. L. Kirkpatrick (pp. 3-9); Suggestions for a Sociological Analysis of the Rural Church, by H. W. Beers (pp. 10-17); Farmers' Co-operative Associations, by R. C. Smith (pp. 18-28); The Relationships of Mohammedan Culture Patterns to Social Processes in the Mohammedan Community in India, by J. L. Hypes (pp. 29-37);

The Influence of National Cultural Patterns on the Rural Life of Japan, by F. R. Yoder (pp. 38-44); Contrast of Some Major Elements in the Social Pattern of Rural China and Rural America, by W. A. Anderson (pp. 45-51); and The Family and Village in India, by W. H. Wilson (pp. 52-64).

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Rural adult education, B. Y. LANDIS and J. D. WILLARD (*New York: Macmillan Co., 1933, pp. XIII+229*).—The results of a research project of the American Association for Adult Education are presented. The several chapters deal with the significance of rural life in American civilization, social and economic factors influencing adult education, library services, the public schools, agricultural extension, college and university extension, parent education, religious organizations, farm organizations, the cultural arts, radio programs, folk schools, and community study and organization. Part 3 discusses the main problems involved in improvement of rural adult education and the objectives of a program, and contains certain suggestions for a national program.

Fifth Ohio Dairy Day (*Ohio Sta. Spec. Circ. 42 (1932), pp. 4, figs. 5*).—A program for Ohio Dairy Day held at Wooster, August 12, 1932.

Rural school organization in Michigan, F. M. THRUN (*Michigan Sta. Spec. Bul. 229 (1933), pp. 32, pls. 6*).—Results are presented of a study of the organization and administration of the public schools of the State in relation to costs and efficiency in educational service rendered. Costs have risen until in 1930 the annual outlay amounted to some \$135,000,000.

The different kinds of school districts, including primary school, city school, graded school, township unit, rural agricultural school, and county agricultural high school districts, are discussed. Conclusions drawn from surveys of six selected counties are presented. The prevailing independent school district system is said to lack coordinated leadership in educational policies. That the district form of administration is lacking in financial efficiency is indicated by the fact that it does not permit the most efficient use and planning of school facilities. Great economies could be realized by enlarging the unit of administration. Suggested changes include flexible attendance areas; a central board empowered to prepare or review school budgets, plan new building requirements, and control the issue of bonds; supervision by an appointed county superintendent possessing proper qualifications and having greater powers than the present county commissioner of schools; centralized purchasing of supplies and equipment; and enlargement of the taxing unit. Opposition to a larger unit comes from districts enjoying a tax advantage. This opposition might be overcome by the adoption of an equalization plan by the State.

The bulletin was prepared as a report to the Michigan Commission of Inquiry into County, Township, and School District Government.

Buildings and equipment for home economics in secondary schools, M. BRODSHAUG (*Thesis, Columbia Univ., New York, 1932, pp. X+179, fig. 1*).—The evolution of home economics plant facilities, the nature of home economics education in senior and junior high schools, space allotment for different purposes, building problems, and the equipment for different lines of work are considered and suggestions made for planning the home economics department in a secondary school. Appendixes include tabulations of data gathered as to space and miscellaneous equipment, an analysis of State standards for home economics plant facilities, and a check list for evaluating objectives and topics preliminary to a study of plant facilities and equipment for home economics.

Food, M. R. FRIEND and H. SHULTZ (*New York: D. Appleton & Co., 1933, pp. XX+304, figs. 80*).—This is one of a series of beginning texts in home economics. The material in each discussed is organized for the unit plan for teaching.

The three units in this volume are food preparation, including sections on preparing the three daily meals; nutrition, including sections on fuel, protein, mineral, and vitamin needs, ridding the body of waste, and the needs of a balanced diet; and marketing, including sections on meal plans and the market list, choosing for good qualities, preventing waste in storage, cost of service, and the buyer and storekeeper. The unit on food preparation is of the practical art type and the other two of the science type.

Clothing, M. R. FRIEND and H. SHULTZ (*New York: D. Appleton & Co., 1933, pp. XX+300, pl. 1, figs. 121*).—This volume is one of the series noted above. The units used are good grooming, beauty in dress through color and design, choice of fabrics, care of clothing, and a girl's allowance.

Living in our homes, M. R. FRIEND and H. SHULTZ (*New York: D. Appleton & Co., 1933, pp. XVIII+274, figs. 94*).—This volume is one of the series noted above. The units used are cooperation in the home, a girl's room, play in our homes, and pleasure from our foods.

FOODS—HUMAN NUTRITION

Food, health, vitamins, R. H. A. and V. G. PLIMMER (*London and New York. Longmans, Green & Co., 1932, 5. ed., pp. XII+143, pl. 1, figs. 12*).—This is the fifth edition of the popular booklet formerly called *Food and Health* (E.S.R., 56, p. 791).

[**Food and nutrition studies at the Florida Station**], O. D. ABBOTT, L. W. GADDUM, and C. F. AHMANN (*Florida Sta. Rpt. 1932, pp. 92, 94, 95*).—In this progress report (E.S.R., 67, p. 619), projects on which findings are reported include studies of plant pigments as sources of vitamin A, the glucosides of citrus fruits, methods of preventing the development of rancidity in pecans, the value of improved diets in the nutrition of children with hookworm infection, and the jellying properties of several varieties of blackberries and grapes.

Edible mollusks of Manila, F. TALAVERA and L. A. FAUSTINO (*Philippine Jour. Sci., 50 (1933), No. 1, pp. 1-48, pls. 18, figs. 6*).—In this compilation of information on various species of shellfish sold and used in and around Manila, the mollusks are arranged in order of their importance by families, beginning with oysters. Inasmuch as practically all of the mollusks are sold in their shells, descriptions of the shells, with photographs, are given for each species. Notes are included on the general occurrence, habitat, and habits; the cultivation, collection, and utilization of the different families or types; and the special properties of different species under each family.

A study of the losses incurred in cooking and the factors affecting the palatability of the New Mexico pinto bean; with a later similar study of the bayo and other varieties of beans (*New Mexico Sta. Rpt. 1932, pp. 58, 59*).—This progress report (E.S.R., 67, p. 86) summarizes the findings in a study of the factors affecting the palatability of the New Mexico pinto bean on baking.

Further studies on the use of wheat bran as a laxative: Observations on patients, G. R. COWGILL and A. J. SULLIVAN (*Jour. Amer. Med. Assoc., 100 (1933), No. 11, pp. 795-802, fig. 1*).—The investigation noted previously (E.S.R., 68, p. 856) was extended to six male subjects who had suffered from constipation for a considerable period. These subjects subsisted on carefully selected and controlled basal diets throughout a period of approximately 8 to

10 weeks. At intervals the diets were supplemented with one of the products under investigation, which included commercial bran, a processed bran product, and fruits and vegetables, all furnishing definite amounts of fiber varying from 50 to 113 mg per kilogram of body weight daily. The general plan of the experiment and the criteria for laxative action were the same as in the earlier study.

One subject was unable to take fibrous roughage either as commercial bran, processed bran, or fruits and vegetables. In this subject agar agar fed at a fiber intake of about 50 mg per kilogram gave satisfactory results, but was not tolerated at a 90-mg level. In the other subjects the commercial bran and processed bran, when taken in such amounts as to bring the daily fiber intake up to 90 mg per kilogram of body weight, were effective in correcting the constipation, while the fruits and vegetables furnishing the same amount of fiber were satisfactory in only two cases. The commercial bran was slightly superior in its laxative effect to the processed bran, but was much less palatable and more difficult to ingest in reasonable quantity. In these subjects unchanged fiber recovered in the feces was much less than was the case with the healthy men studied in the earlier investigation.

"It is suggested that the tendency to constipation which these patients exhibited was due to this fact. A diet of common foods that will suffice to promote satisfactory laxation in healthy persons evidently will do so in some of these patients but not in all, and, therefore, the latter require some form of roughage that will resist all decomposition. Both commercial wheat bran and the processed bran product tested in this study were found to be satisfactory sources of fibrous roughage for these patients."

The effect of pasteurization upon the nutritive properties of milk, W. G. SAVAGE (*Lancet* [London], 1933, I, Nos. 8, pp. 429-433; 9, pp. 485-488).—This critical review of the literature on the subject includes changes in the mineral constituents, enzymes, and vitamins produced in milk by pasteurization; the chemical composition of raw and pasteurized cow's milk and human milk; feeding experiments with raw and pasteurized milk on rats, pigs, calves, and guinea pigs, with a discussion of their validity as applied to human feeding; and human feeding experiments involving a comparison of raw and pasteurized milk and dried milk.

It is pointed out that the known changes in cow's milk produced by pasteurization are very slight and, as far as calcium and possibly phosphorus are concerned, tend to make it approximate a little more closely in composition human milk; that while animal feeding experiments furnish some evidence that pasteurized milk is less favorable than raw milk for promoting growth in animals, the calcium needs of which are equal to or greater than that of the calf, they furnish no evidence that it is less favorable for animals such as human infants whose needs for calcium are lower than that of the calf; and that there are no human experiments demonstrating that pasteurized milk is less nutritive than raw milk for young children. "For much older children, if their diet is insufficient in calcium, it is possible that the small reduction in available calcium which seems to occur with pasteurization might exert a slight retardation of growth. At the most this would be slight and probably unimportant, while at present it is only a possibility. It is too small to have any significant bearing on the value of pasteurization."

A list of 49 references to the literature is appended.

The utilization of calcium and phosphorus from various forms of milk and milk products (*Kansas Sta. Bien. Rpt.* 1931-32, pp. 144, 115).—This progress report (E.S.R., 64, p. 895) summarizes data on the relative proportions of calcium and phosphorus in different types of cheese.

Soy bean (vegetable) milk in infant feeding.—Preliminary report, F. R. RITTINGER and L. H. DEMBO (*Amer. Jour. Diseases Children*, 44 (1932), No. 6, pp. 1221–1238, figs. 8).—This report includes a review of the literature on the use of soybean milk as an infant food, a compilation of published data on the composition of soybeans, a summary of a study by H. Goldblatt of the contents of vitamins A, D, and B (complex) in a commercial soybean milk powder, results of preliminary tests of the value of soybean milk powder as an exclusive food for rats, and a report and discussion of a preliminary clinical study of the use of a specially prepared soybean milk in infant feeding.

The soybean milk powder contained 560 Sherman units of vitamin A and 28 Steenbock units of vitamin D per ounce. In the vitamin B tests the technic of Bourquin was used as regards depletion period and length of experimental period, but there was no differentiation of vitamin B₁ from B₂. A value of 22 units of the vitamin B complex per ounce was reported.

For the clinical tests, soybeans of the Mammoth Yellow variety were cleaned, washed, specially treated to remove unpleasant flavors, and converted to a milky fluid to which were added special sugars, salts, and oils to make up recognized deficiencies in the beans. The mixture was homogenized, spray dried, and packed in tin cans evacuated with nitrogen. The powder contained moisture 2.5, protein 23.69, fat 20.2, carbohydrate 48.31, total ash 5.3, and starch 0.5 percent. When reconstituted with boiled water in the proportion of 35 g of powder to 8 oz. of water, the liquid contained 3.6 percent of protein, 3.07 of fat, and 7.3 percent of carbohydrate, and had a pH value of 5.5.

The 50 infants selected for the study included breast-fed infants receiving an insufficient quantity of milk from their mothers and infants which received no other food than the soybean milk. The experiment was started when the infants were about 4 weeks old and was continued for a year. The usual supplements of cod-liver oil and orange juice were given with other supplements at the proper ages.

In general, growth and development were satisfactory on the soybean milk. The stools were of normal consistency and resembled those of the normal breast-fed infant in bacterial flora, but were much more bulky. In a few instances satisfactory gains were not made. The question is raised as to the relative availability of the soybean milk protein as compared with normal protein. To test this point nitrogen metabolism experiments are under way.

An investigation into the effect of certain factors upon child health and child weight, G. C. M. MCGONIGLE and P. L. MCKINLAY (*Jour. Hyg. [London]*, 32 (1932), No. 4, pp. 465–488).—Of particular interest in this report of the analysis of a large number of record cards of children who had attended child welfare centers in an industrial town on the northeast coast of England is the frank discussion of the limitations in such a study. It is emphasized in particular that “any attempt accurately to study the influence of any factor (such as diet) on the incidence of certain pathological conditions in childhood would require to take account of at least the three following factors: (1) The degree of any such factor, e.g., the amount of any deviation from a ‘normal diet’; (2) the period of time over which the factor is operative; (3) the age of the child at which the deviation began and over which it lasted.” It is admitted that the record cards available did not make possible accurate estimation of the three factors enumerated and that in such an investigation “the plan of campaign should precede, not succeed, the collection of information.”

The effect of other factors upon the reliability of health records is discussed, with special emphasis on the influence of personal bias in recording information. In this connection it is considered advisable although often impractical for the

investigator who records the nature of the diet to work independently of the physician who records the clinical data.

The report proper consists of two sections, the first dealing with the incidence and possible correlation between certain conditions discovered among the 741 children whose records were studied. These included unsatisfactory diet, bone conditions, pharyngeal conditions, dental decay, squint, anemia, diarrhea, bronchitis, and otorrhea. The most significant positive correlations were shown between defective diet and bone defects, pharyngeal conditions, dental decay, squint, and anemia. The second section dealt with the relation between infant weight and certain factors, including diet, overcrowding, size of the family, maternal health, and maternal efficiency. The highest and most consistent relationship to weight of the children was the efficiency of the mother, although the method of determining this is not stated.

Physical unfitness in the preparatory school, W. R. P. EMERSON (*Amer. Jour. Diseases Children*, 44 (1932), No. 3, pp. 509-523, figs. 2).—This discussion is based upon records obtained over several years of the health status and height and weight measurements of a large number of entering students at Dartmouth College and Massachusetts Institute of Technology and of students in eight representative high schools and seven leading private schools.

Physical unfitness to an appalling degree was found, not only among students entering college and preparatory schools but also among those who had had the benefit of health programs. The explanation offered to account for the failure of present-day health programs is that the essential causes of impaired health are not found and corrected.

"The chief obstacle to health work is the persistent idea that if a person is not sick he is well, which prevents the physician from entering the field of health in the same scientific spirit in which he meets the problems of disease. Because of the failure of present health programs as indicated by the extent of physical unfitness, the plea is made that medical training should be as efficient in the diagnosis of health as in that of disease."

Some factors determining the insensible perspiration of man, F. G. BENEDICT and H. S. H. WARDLAW (*Arch. Int. Med.*, 49 (1932), No. 6, pp. 1019-1031).—Attention is called to various precautions which must be taken if insensible perspiration measurements are to be applied successfully to physiologic and clinical problems, and an investigation of the effect of various factors upon such determinations is reported, with results which are summarized as follows:

"When measured under the usual conditions obtaining in basal metabolism experiments, the rate of insensible perspiration of an adult man became constant within 30 minutes after the assumption of the lying position. Changing from the lying to the sitting position caused an increase of 20 percent in the rate of insensible perspiration under the special experimental conditions. Sleep during the daytime had no significant effect on the rate of insensible perspiration. Sleep at night lowered it markedly. About 15 percent of the total loss by insensible perspiration was due to the loss from the surfaces of the hands and feet. Of the total skin loss, 30 percent was derived from the surfaces of the hands and feet. The rate of loss from the hands and feet was approximately three times greater than that from the rest of the skin per equal unit of skin area. Heating the feet increased the loss by insensible perspiration considerably."

The authors conclude that the accurate measurement of insensible perspiration may have considerable clinical value, but that the method has its limitations which must be clearly recognized.

The importance of temperature on the survival time of bacteria in acid foods, P. J. BEARD and P. J. CLEARY (*Jour. Prev. Med.*, 6 (1932), No. 2, pp.

141-144).—Nutrient broth at pH 3.5 and 4 was seeded with strains of *Eberthella typhosa*, *Shigella dysenteriae*, and staphylococci, stored at temperatures of 37.5°, -4°, and -12° C., and tested from time to time for viability of the organisms, new tubes being used for each sample. Similar tests were carried on with orange juice at pH 3.5 inoculated in the same way and stored at -4°.

Both series of tests showed an appreciable inhibition of the bactericidal effect of acidity at low temperatures. In the orange juice the survival period varied from 50 hours for staphylococci to 170 hours for strains of *E. typhosa* and *S. dysenteriae*. "This suggests the possibility of infection by this group of organisms in highly acid foods preserved only by storage at such temperatures. This possibility of infection is increased by the fact that such foods are frequently served with little storage—indeed freshness is often made a selling point. Danger is probably decreased by the fact that massive infection of the product would be relatively rare. It follows that preparation and handling of such foods should be subject to as rigid regulations and inspection as are applied to other types of food."

The significance of phosphoric esters in metabolism, R. ROBISON (*New York: N.Y. Univ. Press; London: Humphrey Milford, Oxford Univ. Press, 1932, pp. IX+104, pls. 8, figs. 10*).—This volume consists of three lectures delivered in 1931 at the New York University and Bellevue Hospital Medical College under the auspices of the Herter Lecture Foundation. The first lecture deals with the occurrence of phosphoric esters in nature, the second with calcification of cartilage and bone, and the third, which is illustrated by numerous photomicrographs and drawings, with calcification in vitro. Literature references are given at the end of each section.

Recent research on the vitamins (*Nature [London], 131 (1933), No. 3300, pp. 118-121*).—This concise review of recent vitamin literature is intended to serve as a supplement to the summary by Drummond in lectures given in April and May 1932 (*E.S.R.*, 68, p. 704).

Preliminary report on the vitamin content of the mango, E. O. V. PERRY and S. S. ZILVA (*London: Empire Marketing Bd., 1932, pp. 20*).—Three varieties of Indian mango, Alphonso, Cawasji Patel, and Shendrya, shipped in the fresh state from India to England, were tested for vitamins A, C, and D in 1931 after preliminary tests had been conducted in 1930 on the vitamin A and C content of the Alphonso variety. The tests were carried out for the most part on the pulp only.

The three varieties showed decreasing vitamin C content in the order named. The Alphonso variety proved to be a very rich source of this vitamin, from 0.5 to 1 g daily proving sufficient for complete protection to guinea pigs during a 90-day period. The rind of this variety proved equally potent in vitamin C. The Cawasji Patel was nearly as potent, from 1 to 1.5 g sufficing for complete protection. The Shendrya variety contained very little vitamin C. Attention is called to the fact that the mango has an importance in the Tropics similar to that of the apple in temperate countries, and that the Alphonso variety contains about six times as much vitamin C as the most potent apple thus far examined, the Bramley Seedling (*E.S.R.*, 64, p. 498).

The Alphonso variety was slightly richer than the other two in vitamin A. On 0.2 g daily complete protection was secured, although growth was not equal to that of the controls receiving cod-liver oil. From the results obtained, the mango is considered to be a fairly potent source of vitamin A, resembling butter in this respect.

Vitamin D was not found in significant amounts in any of the varieties tested.

Vitamin A in the pimiento pepper, L. ASCHAM (*Science*, 77 (1933), No. 1997, p. 351).—In this brief preliminary report from the Georgia Experiment Station it is announced that in vitamin A tests according to the Sherman technic fresh, commercially canned, and dried pimiento pepper induced a growth response above the unit rate in quantities equivalent to 4 mg of the material, calculated on the dry basis, and that the dried material contained from 200 to 300 mg of carotene per kilogram.

Vitamin content of common foods (*Georgia Sta. Rpt. 1932*, p. 39).—This is a preliminary report of the content of vitamins B and C in the Puerto Rican sweetpotato, raw, boiled, and baked.

A determination of the vitamin content of some common fruits and other foods (*Kansas Sta. Bien. Rpt. 1931-32*, pp. 113, 114).—This progress report (E.S.R., 64, p. 896) summarizes data on the relative vitamin B (B_1) content of milling products made from Kansas hard red winter wheat and on four yeast breads made without milk from different milling products.

The vitamin B and G content of raw and cooked broccoli, H. E. MUNSELL and H. B. KIFER (*Jour. Home Econ.*, 24 (1932), No. 9, pp. 823-826, figs. 2).—The experiments reported were conducted in the winter on California-grown broccoli. To obtain representative samples of buds, stems, and leaves, the material was chopped finely on a glass plate with a special chopper made of safety razor blades inserted in a brass block. For the cooked sample the vegetable was prepared for cooking, weighed, cooked until tender (about 15 minutes) in a small quantity of slightly salted, rapidly boiling water, cooled, and weighed again. Any water remaining was discarded, and the cooked material was chopped in the same way as the raw.

For both vitamin B and G determinations, modifications of the Sherman-Spohn diet for determining the vitamin B complex were used. The source of G in the B experiments was 10 percent autoclaved yeast, and of B in the G experiments such an amount of an 80 percent (by weight) alcoholic extract of rice polish that 100 g of the diet contained the extract of 18 g of the rice polish. In the vitamin B experiments, quantities of 1, 2, 3, and 4 g of the raw material and equivalent portions of the cooked were used. The 3-g samples induced a total average gain in weight of 25 g during the entire test period, thus indicating that 3 g of raw broccoli contains 1 unit of vitamin B. The amount of cooked broccoli equivalent to 4 g of raw induced about the same gains in weight as 2 g of the raw material, thus indicating a 50 percent loss in cooking.

In the vitamin G test, unit gains were not secured. According to the chart, 2 g of raw broccoli induced a gain of not quite 20 g in the 8 weeks' period. The animals fed an equivalent amount of cooked broccoli gained at a somewhat lower rate. The authors conclude that broccoli contains "a measurable quantity of vitamin G", and that there is "slight destruction of this vitamin during cooking."

The content of vitamin B_1 in the organs of white rats on normal and vitamin B_1 -free diets [trans. title], H. G. K. WESTENBRINK (*Arch. Néerland. Physiol. Homme et Anim.*, 17 (1932), No. 4, pp. 560-577, figs. 8).—Various organs of normal rats and of paired rats which had subsisted for definite lengths of time on a vitamin B (B_1)-free ration were fed to other paired rats as the sole source of vitamin B, and the relative content of vitamin B in the various organs was estimated by comparisons of the growth curves of the animals receiving corresponding organs of the normal and the experimental animals. As thus determined, the liver, kidney, and heart were found to have the highest content of vitamin B after the first week of deficiency, followed by the brain and then by the muscles, tongue, spleen, stomach, and intestines.

All of these organs with the exception of the brain lost the greatest part of their vitamin B content during five weeks' subsistence on the vitamin B-free ration.

The retention of vitamin B in the brain is thought to point to this organ as the primary seat of the action of this vitamin, as suggested by the studies of Gavrilescu and Peters (E.S.R., 67, p. 634). It is indicated that further studies of the mechanism of the action of vitamin B should be concentrated on the brain.

Vitamin C in canned citrus products, C. R. FELLERS and P. D. ISHAM (*Jour. Home Econ.*, 24 (1932), No. 9, pp. 827-832, figs. 4).—The products tested at the Massachusetts State College included canned orange juice, orange slices, grapefruit juice, and grapefruit slices and fresh orange juice and grapefruit juice. The oranges and grapefruit were grown and canned in Orlando, Fla. The canned products were taken from grocers' stock at Buffalo, N.Y., and were from 7 to 10 months old when examined. The fresh juices were expressed from Florida fruits bought in the public market at Amherst, Mass., during August and September and thus had undergone from 6 to 9 months' storage.

The canned orange juice was fully protective to guinea pigs in daily doses of 1 g over the 90-day experimental period. The other three canned products were slightly less effective, but from the excellent growth and complete protection on 2-g doses it is estimated that slightly more than 1 g of these products would be sufficient for complete protection. The freshly expressed juices were fed at the 1.5-g level. Protection against scurvy was secured with both orange and grapefruit juice, but growth and physical condition were slightly inferior on the grapefruit juice.

In explanation of the excellent results with the canned citrus products, the authors suggest that the hermetically sealed tin can prevents oxidation of vitamin C.

The determination of vitamin C (antiscorbutin) in milk [trans. title], B. BLEYER (*München. Med. Wchnschr.*, 80 (1933), No. 7, pp. 257, 258).—A summary is given of the results obtained in testing various types of milk for antiscorbutic activity by the Tillmans reducing test (E.S.R., 69, p. 7). The data, when given numerically, are in terms of titration values representing the number of cubic centimeters of the indicator required to complete the titration of 100 cc of the milk.

The titration value of human milk was highest in the colostrum and decreased to a fairly constant level after about a month of between 40 and 50 cc. Cow's milk showed greater variation than human milk, but averaged about 20 to 25 cc, or about half that of human milk. In certain instances human milk was about four times as high in vitamin C as market milk. Transportation and storage were more destructive to the vitamin C content of cow's milk than quick scalding as practiced in the home. Pasteurization by the holding process proved more destructive than heating to the boiling point for a short time. The nature of the container in which milk is stored, shipped, or treated was found to have considerable influence on the stability of the vitamin.

Nickel, chromium, and aluminum were without effect and copper and silver quite destructive. Heat increased the destructive effect. The drying of milk by the roller process was less destructive of vitamin C than by the spray process. Irradiation of dried milk to increase its vitamin D content tended to destroy vitamin C. Sweetened condensed milk was richer in C than unsweetened. Various buttermilk products on the market contained relatively high proportions of vitamin C.

Titration values for fresh milk from other animals on the same satisfactory feed were goats 22 to 28 cc, sheep 3 to 4, and asses 150 cc. Camel's milk was reported as having values twice that of cow's milk.

Some sources of vitamin C in India, Part II (Continued) (*Indian Jour. Med. Res.*, 19 (1931), No. 2, pp. 393-413, figs. 8; 20 (1932), No. 1, pp. 89-106, figs. 10).—The two papers noted below are in continuation of an earlier study⁷.

The antiscorbutic values of the fruits, R. C. Wats and W. I. White (pp. 393-413).—In the feeding experiments on guinea pigs reported, the basal diet used consisted of bran and crushed oats with crushed or ground chick-pea or gram (*Cicer arietinum*) in place of heated milk. Contrary to the present custom of using animals weighing only about 300 g, most of the test animals weighed 400 g or more, some over 700 g, at the beginning of the experiment. This fact, together with the use of but a single animal for a given amount of the material tested, makes the results of little quantitative value.

The fruit which appeared to be richest in vitamin C was the pomelo (*Citrus decumana*), 1 cc of the juice of which afforded complete protection. Next in order was pineapple (*Bromelia ananas*). The peeled fruit was fed in 1-, 3-, and 7-g amounts, and complete protection was secured with 3 g. Peeled bananas (*Musa paradisiaca*) were fed in amounts of 5, 10, and 15 g, with complete protection on the smallest amount. The results with oranges did not compare favorably with published data, for 10 cc of juice was required for protection. The juice of sweet limes (*C. medica limetta*) was tested in amounts of 1, 3, and 5 cc daily, and protection was not secured with even the largest amount. Pomegranates (*Punica granatum*) and pears (*Pyrus communis*) were also very low in vitamin C, for amounts as high as 20 cc of pomegranate juice and 10 g of the peeled fruit of pears afforded no protection.

Germinated pulses, tomatoes, mangoes, and bananas, R. C. Wats and C. M. E. Eyles (pp. 89-106).—The pulses tested for their germinating properties included the chickpea (*Cicer arietinum*), peas (*Pisum sativum*), mung (*Phaseolus mungo*), urd (*P. mungo radiatus*), lobia (*Vigna catjang*), and soybean (*Glycine hispida*). These were soaked for 24 hours and then allowed to stand at room temperature for 24 hours between layers of moist lint. Only a small percentage of the lobia and soybeans germinated. In the others the percentage varied from 65 percent in the case of urd to 90 percent in the peas. The germinated soybeans were not tested for vitamin C. The others were fed in amounts of 3, 4, and 5 g daily. None of the animals grew normally, and protection against scurvy was secured only with the germinated mung beans in amounts of 3, 4, and 5 g, urd 4 and 5, and lobia 5 g.

Ripe green and red bananas, varieties of *M. sapientum*, were fed to groups of 3 animals each in amounts of 5, 10, and 15 g of the pulp. Scurvy was prevented with 10 g of the red pulp, but even 15 g of the green proved insufficient.

The tomato (*Lycopersicum esculentum*) tested was described as about the size of a large plum, deep red in color, and uniformly round. Amounts of 3, 5, and 7 cc of the juice were fed, with protection in the case of the two larger doses.

The mango (*Mangifera indica*) tested was locally called "nettiya" and described as having no fiber in the pulp. Ten cc of the pulp afforded complete protection.

Vitamin-D in cacao beans (*Jour. Soc. Chem. Indus., Chem. and Indus.*, 51 (1932), No. 49, p. 1008).—A brief note stating that a sample of raw ground cacao bean (with shell removed) was found by K. H. Coward to have a vitamin D potency of one unit (E.S.R., 59, p. 689) per gram.

⁷ Some sources of vitamin C in India, Part I, R. C. Wats. *Indian Med. Gaz.*, 64 (1929), pp. 79-85, figs. 5.

Lesions of the nervous system in vitamin deficiency.—I, Rats on a diet low in vitamin A, H. M. ZIMMERMAN (*Jour. Expt. Med.*, 57 (1933), No. 2, pp. 215–228, pls. 4).—Observations of marked weakness and incoordination of the extremities in rats on diets deficient in vitamin A led to macroscopic and microscopic studies of the tissues of the central and peripheral nervous systems of rats suffering from this deficiency. Seven groups, comprising a total of 23 animals, were used. The conditions of the experiment varied in the different groups with respect to the diet of the mothers during pregnancy and lactation and the stage of deficiency at which the experimental animals were sacrificed for examination. Staining methods were selected to give both a positive (Marchi and Scharlach R preparations) and a negative (Spielmeyer preparations) picture of any possible degeneration in the medullary sheaths.

On gross examination no abnormalities could be detected in the brain, spinal cord, peripheral, or optic nerves of any of the animals. On microscopic examination, no abnormalities could be detected in the optic nerves or, with the exception of one animal, in the brain. The changes in the nervous system observed microscopically are summarized as follows:

“Degeneration of the medullary sheaths of the brachial plexuses and sciatic nerves, and less often of the vagus nerves. . . . Degeneration of the medullary sheaths of the sensory tracts on the periphery of the spinal cord and in the posterior columns. . . . Changes of the same nature in the posterior nerve roots and less frequently in the anterior nerve roots of the spinal cord.”

The examination of the tissues of animals killed at various stages of the deficiency and recovery showed that the lesions were not present for any appreciable period preceding the onset of clinical signs of muscular weakness and incoordination, but were present to a marked degree for a short but undetermined period following clinical signs of recovery from the nervous disease.

Attention is called to the fact that the ration employed contained no cereals which might have contributed a toxic substance to account for the degeneration of the myelin sheaths, and that a deficiency in unsaturated fatty acids did not appear to have played any role.

The effect of parathyroid hormone and of irradiated ergosterol on calcium and phosphorus metabolism in the rat, L. I. PUGSLEY (*Jour. Physiol.*, 76 (1932), No. 3, pp. 315–328, figs. 11).—In this contribution to the question of the relationship of the parathyroid hormone and vitamin D to calcium and phosphorus metabolism, a comparison was made of the effects of parathyroid hormone and large doses of irradiated ergosterol on calcium and phosphorus excretion in adult rats. Other experiments included the effect of parathyroid hormone upon the serum calcium of adult rats, of irradiated ergosterol on the phosphorus and calcium excretion in rats refractory to parathyroid hormone, of the urine of immune rats receiving parathyroid hormone on the calcium excretion of responsive rats, and of the injection of serum of immune rats upon the response of normal rats to parathyroid hormone.

The injection of parathyroid hormone in doses of from 5 to 20 units daily led to an increase in serum and fecal calcium and urine phosphorus and a relatively more striking but transient increase in urine calcium. The oral administration of irradiated ergosterol in doses of 20,000 to 50,000 units daily led to an increase in urine calcium but a decrease in fecal calcium and phosphorus. A further difference between the action of the two agents was shown in the apparent immunity of rats to parathyroid but not to irradiated ergosterol. This immunity developed quite rapidly, but animals almost completely immune to parathyroid were still responsive to irradiated ergosterol.

It is concluded that “if large doses of irradiated ergosterol do stimulate parathyroid secretion, this is but a small part of their pharmacological action.”

The effect of irradiated ergosterol on calcium and phosphorus retention in children, C. B. WELD and J. F. SYKES (*Roy. Soc. Canada, Trans.*, 3. ser., 26 (1932), *Sect. V*, pp. 81-88).—Calcium and phosphorus balances were determined in six growing children receiving a diet somewhat restricted in calcium but otherwise adequate. The diet was given unsupplemented with vitamin D for 5 weeks, and in the case of four of the subjects supplemented during the succeeding 5 weeks by 50 Steenbock units daily of irradiated ergosterol.

No significant differences were noted in the retention of calcium or phosphorus as the result of the addition of vitamin D. The calcium balances were negative in all cases but one. This subject was older than the others and her diet throughout the whole experiment had been increased by one third over that of the others.

The effect of irradiated ergosterol upon the absorption of calcium, N. B. TAYLOR and C. B. WELD (*Roy. Soc. Canada, Trans.*, 3. ser., 26 (1932), *Sect. V*, pp. 9-12, *figs. 2*).—This report and the two noted below are preliminary communications dealing with various phases of the problem of the mechanism of the action of irradiated ergosterol as determined by experiments on dogs. In the present report a few data are presented on the calcium excretion in young dogs on adequate and rachitic diets supplemented by varying but not excessive amounts of irradiated ergosterol. No evidence was obtained of increased absorption of calcium. On the contrary, there was definite indication of increased excretion of calcium even in small doses and of a decided increase in excretion on larger doses.

The effect of small (therapeutic) doses of irradiated ergosterol upon the serum calcium, N. B. TAYLOR and C. B. WELD (*Roy. Soc. Canada, Trans.*, 3. ser., 26 (1932), *Sect. V*, pp. 13-16, *figs. 4*).—The evidence presented indicates that small doses of irradiated ergosterol by mouth, or larger doses subcutaneously, invariably cause a depression in serum calcium as an initial effect.

The administration of irradiated ergosterol to dogs with biliary fistulae, N. B. TAYLOR, C. B. WELD, and J. F. SYKES (*Roy. Soc. Canada, Trans.*, 3. ser., 26 (1932), *Sect. V*, pp. 29-31, *fig. 1*).—The possibility is suggested that bile is necessary for the absorption of irradiated ergosterol in dogs with biliary fistulae. The administration of irradiated ergosterol by mouth was not followed by hypocalcemia or any other sign of overdosage. When the ergosterol was injected intravenously, a rise in serum calcium was induced in some of the animals but not in others. Bile collected from animals receiving the ergosterol by mouth had no antirachitic properties, while that from animals treated intravenously was definitely antirachitic.

The absorption of irradiated ergosterol by bile is thought to afford an explanation of various phenomena connected with its administration. The prolonged effect of a single dose can be explained by the excretion of the irradiated ergosterol into the bowel and its reabsorption by the bile. "The varying degrees of susceptibility between different species and individuals of the same species may possibly find an explanation in the variability of absorption. The relatively low curative power of irradiated ergosterol in some cases of rickets in infants may also be a matter of defective absorption."

The mobilization and excretion of calcium following overdosage with irradiated ergosterol, N. B. TAYLOR and C. B. WELD (*Brit. Jour. Expt. Path.*, 13 (1932), *No. 2*, pp. 109-127, *figs. 2*).—In this contribution to the disputed question as to the source of excess serum calcium following overdosage with irradiated ergosterol, experimental evidence obtained for the most part on dogs is reported, leading to the following conclusions:

"The hypercalcemia following large doses of irradiated ergosterol is due to the withdrawal of calcium from the skeleton. Ergosterol overdosage de-

presses the power of the intestine to excrete calcium. The calcium mobilized from the bones accumulates in the serum. A certain level of serum calcium having been reached, an increase in the urinary calcium follows. Ergosterol in the amounts which produce hypercalcemia does not increase absorption of calcium from the intestine."

Effect of sunshine through window glass and fresh air on resistance to infection: Experiments on animals, J. R. ROSS, E. C. ROBERTSON, and F. F. TISDALL (*Amer. Jour. Diseases Children*, 45 (1933), No. 1, pp. 81-95, figs. 6).—Data are reported showing that "the exposure of rachitic rats to sunshine transmitted by common window glass outdoors markedly raises their resistance to an oral infection with 'rat typhoid', although the rickets is not improved. The beneficial effect of exposure to fresh air alone is approximately half that of the combination of fresh air and sunshine through glass. The addition of vitamin D to this rachitogenic diet also increases the resistance of the rats to the infection, and if they are exposed to sunshine under window glass as well, the resistance is still further raised."

The authors conclude that "the vital radiations from the sun should not be limited to the narrow band in the short ultraviolet region, which is anti-rachitic. The foregoing results show definitely that rays longer than those that are necessary to prevent or cure rickets have a marked effect on the animal organism, as evidenced by a decided increase in the resistance to infection."

Efficiency of New Orleans sunshine in preventing rickets in rats, H. LAURENS and H. S. MAYERSON (*Amer. Jour. Diseases Children*, 45 (1933), No. 1, pp. 66-80).—The seasonal changes in the antirachitic activity of New Orleans sunshine and skyshine over a period of 2½ years were measured biologically by suitable exposure of rats on a rachitic diet and physically by means of a pyrheliometer and a spectrograph. Some of the animals were also exposed behind Vitaglass, Corex D, and Cel-O-Glass.

The average length of daily exposure to sunshine (sun plus sky) required to prevent rickets in rats was from 2 to 3 minutes from April through October and from 5 to 6 minutes from November through March. Exposures through the three types of special glass were also effective, although somewhat longer times were required. The average time required for protection by exposure to skyshine alone was from 16 to 17 minutes daily from May through September, from 22 to 28 minutes from October through February, and from 16 to 20 minutes during March and April. Correspondingly longer exposures under Vitaglass and Corex D were effective, but Cel-O-Glass was effective only through the summer months.

Rickets: Comparative value of several light sources for cure and prevention, A. KNUDSON (*Amer. Jour. Diseases Children*, 44 (1932), No. 3, pp. 531-541, fig. 1).—Comparisons are reported of the antirachitic potency, as determined by preventive and curative experiments with rats, of several light sources and of winter and summer sunshine in Albany, N.Y. The agents tested and the minimum daily exposure required for the cure and prevention of rickets, respectively, were as follows: Victor Uviarc, operating at 70 v at a distance of 3 ft., 60 and 20 seconds, and G.E. sunlamp, type S1 bulb, 30 and 7 minutes, respectively; exposure to sunshine in June and July 1930, 120 and 30 minutes, in June and July 1931, 90 and 20 minutes, and in January and February 1931, 1,080 (calculated) and 270 minutes, respectively; CX lamp, 60 w, 24 hours at 9 in. and 24 hours at 18 in.; and CX lamp, 500 w, 11 hours at 18 in. and 11 hours at 36 in., respectively. An addendum states that the S2 Mazda sunlamp has been found to have from one fifth to one sixth the potency of the S1 sunlamp.

It is noted that the effectiveness of the sunshine in Albany in winter is approximately the same as reported by Tisdall and Brown for Toronto (E.S.R., 58, p. 495), but that the summer sunshine in Albany is approximately 10 times as effective as in winter, while that of Toronto was reported to be approximately 8 times as effective.

Seasonal variation of antirachitic effect of sunshine in the latitude 42°39' (Albany, N.Y.), A. KNUDSON (*Soc. Expt. Biol. and Med. Proc.*, 30 (1932), No. 1, pp. 66-68, fig. 1).—This investigation has been noted essentially above. Commenting upon the applications to human beings of the findings with rats, particularly the small area of the skin which it is necessary to expose, the author expresses the opinion that "it should be possible to obtain ample radiation in this vicinity for the prevention of rickets for at least 8 to 10 months of the year by exposure of the face and hands to sunshine."

Amount of ultraviolet radiation needed to cure rickets with respect to area of skin exposed, A. KNUDSON (*Amer. Jour. Diseases Children*, 44 (1932), No. 3, pp. 524-530, figs. 2).—Essentially noted from a preliminary report (E.S.R., 67, p. 636).

The use of autolyzed liver in the treatment of pernicious anemia: A preliminary clinical report, W. F. HERRON and W. S. McELLROY (*Jour. Amer. Med. Assoc.*, 100 (1933), No. 14, pp. 1084-1086, fig. 1).—This report covers 13 cases, supplementing a preliminary report announcing the effectiveness of autolyzed liver in the treatment of pernicious anemia (E.S.R., 68, p. 281). It is of interest that the requirement of autolyzed liver by mouth approaches the intramuscular requirement of other liver preparations.

Treatment of pernicious anemia: Effect of a single injection of concentrated gastric juice (addisin), R. S. MORRIS, L. SCHIFF, J. H. FOULGER, M. L. RICH, and J. E. SHERMAN (*Jour. Amer. Med. Assoc.*, 100 (1933), No. 3, pp. 171-173, figs. 4).—Further evidence is given of the remarkable effects obtained in the treatment of pernicious anemia with single doses of concentrated gastric juice (addisin) from swine (E.S.R., 68, p. 869). In the two case reports given the material was administered by intramuscular injection. In one case, 3,200 cc of swine gastric juice was reduced to a volume of 5 cc and in the other 5,700 cc to a volume of 8.5 cc for the single injection. In each instance the injection was followed by intense stimulation of the bone marrow and marked subjective improvement.

"In the light of our limited experience, it seems probable that a product can be obtained from the gastric contents of swine of such potency that a single intramuscular injection may be sufficient to bring about a complete remission in pernicious anemia. Should this prove to be true, it seems not unreasonable to predict that one injection of potent material at intervals of two or more months may be all that is required in this disease to maintain the blood count and the hemoglobin at normal levels."

Anemia of pregnancy: Relation to anemia in general, V. C. ROWLAND (*Jour. Amer. Med. Assoc.*, 100 (1933), No. 8, pp. 537-540).—Two types of anemia of pregnancy are discussed—(1) pernicious or hyperchromic anemia, which is attributed to a relative or temporary deficiency of the intrinsic factor in gastric juice during pregnancy, and (2) secondary or hypochromic anemia, which is attributed to dietetic deficiency and faulty absorption of hemoglobin-forming substances on account of gastro-intestinal disturbances. It is thought that these anemias occur in slight degree in the majority of American women during pregnancy.

"Intelligent management of pregnancy must include a check-up on the condition of the blood and, when there is any degree of anemia, a supervision of the diet, the administration of iron in the secondary or hypochromic form, and the

use of liver extract promptly on the appearance of evidence of the rarer pernicious form or in pregnancy anemia, which is refractory to treatment by iron."

Minimum cost dietaries for diabetic patients, W. A. GROAT and M. I. ROSBROOK (*Jour. Amer. Med. Assoc.*, 100 (1933), No. 8, pp. 566-568).—Included in this paper are a minimum cost dietary in use in welfare work in Syracuse, N.Y., a diabetic dietary with six modifications developed from the minimum cost dietary, and sample menus and diet lists based upon the basic diabetic dietary.

Miscellaneous studies on the iodine and goitre problem in New Zealand, C. E. HERCUS and H. A. A. AITKEN (*Jour. Hyg. [London]*, 33 (1933), No. 1, pp. 55-79, figs. 4).—Included among the findings reported in this extension of the investigation noted previously (E.S.R., 67, p. 487) are data on the content and nature of the iodine present in some New Zealand seaweeds and sea fish; variations in the iodine content of the blood of rabbits during anesthesia, together with in vitro studies of the effect of chloroform and ether on the permeability of blood erythrocytes to potassium iodide, thyroxine, and saline thyroid extract; experimental goiter and iodine balance in rabbits; a comparison of urinary iodine excretion of goiter-free Samoans with that of inhabitants of a goiter endemic center in Christchurch, New Zealand; the incidence of goiter in a mental hospital in the latter locality; and the iodine content of pigs' thyroids in Otago, New Zealand.

TEXTILES AND CLOTHING

The colloid aspects of textile materials and related topics (*Faraday Soc. Trans.*, 29 (1933), No. 1, pp. 6-13, 65-77, 132-211, 218-279, 300-347, pls. 7, figs. 52).—Papers presented at the colloid meeting held at the University of Manchester, September 21-23, 1932, and concerned with various phases of research with natural fibers included: The Fine Structure and the Mechanical Properties of Fibres, by H. Mark (pp. 6-13); Relations between the Refractive Indices and the Behaviour of Cellulose Fibres, by J. M. Preston (pp. 65-77); Protein Structure and Protein Hydration, by D. J. Lloyd and H. Phillips (pp. 132-148); The Constitution of the Keratin Molecule, by J. B. Speakman and M. C. Hirst (pp. 148-172); The Electrical Resistance of Wool Fibres, by M. C. Marsh and K. Earp (pp. 173-193); Some Problems in the X-ray Analysis of the Structure of Animal Hairs and Other Protein Fibres, by W. T. Astbury (pp. 193-211); Contribution to the Study of the Degree of Ripening of Cotton, by O. Roehrich (pp. 218-228); The Modification of Natural Cotton Cellulose by Swelling and by Degradation, by S. M. Neale (pp. 228-238); The Physical Significance of Crimp or Waviness in the Wool Fibre, by S. G. Barker (pp. 239-250); A Discussion of Surface Tension and Dehydration as Contributory Agencies for the Production of Crimp, by E. Hill (pp. 251-257); Chemical Considerations in Relation to the Study of Mammalian Hair Growth—Part I, The Sulphur Economy of Animal Fibre Production, by A. T. King (pp. 258-271), and Part II, Observations on the Chemico-Histological System in Follicle Activity, by A. T. King and J. E. Nichols (pp. 272-279); The Swelling of Silk, by W. S. Denham and E. Dickinson (pp. 300-305); The Tensile Properties of Silk Filaments, by W. S. Denham and T. Lonsdale (pp. 305-316); Note on the "Regain" of Silk of Different Origins, by W. S. Denham and A. L. Allen (pp. 316, 317); Some Observations on the Chemical Degradation of Linen Cellulose, by C. R. Nodder (pp. 317-326); and On the Theory of the Dyeing Process—The Influence of Acid-Dyes on Animal Fibres, by E. Elöd (pp. 327-347).

The effect of sunlight and other factors on the strength and color of cotton fabrics, M. A. GRIMES (*Texas Sta. Bul.* 474 (1933), pp. 56, figs. 27).—White and colored cotton fabrics, including muslins, zephyr gingham, suiting, and voiles, were exposed to sunlight for 25 to 375 hours in 25-hour periods, and in all cases changes in breaking strength and in color occurred, although the loss in strength was not at the same rate or to the same extent in all fabrics. The average loss in breaking strength after 375 hours of exposure ranged from about 8 to 47 percent in the warp and from 18 to 58 percent in the filling. Zephyr gingham and suitings which were dyed with vat dyes usually lost less strength than did the voiles dyed with direct dyes. Dark colors, in general, were less weakened than light colors, probably due to the increased protection given by the vat dyes when in higher concentration and to greater resistance to penetration by light waves which produce tendering. Coarse, hard twisted yarns, in general, were less tendered than fine, soft twisted yarns, mercerized fabrics less than unmercerized, and unbleached less than bleached fabrics. Some of the sizes and finishes seemed to have a tendering effect.

Hours of exposure had a much greater effect than other environmental factors upon loss in strength, and temperature was next, accounting for nearly twice as much change as did relative humidity. Of the structural factors, only percentage take-up and ply significantly affected the change in strength. Much more of the change in strength was due to environmental factors than to structure.

Comparisons of the random, the random-Latin square, and the systematic random method of sampling showed that the last named method, used in the study, in which a sample comprised nine specimens, gave sufficiently accurate results.

Spectrophotometric analyses made before and after exposure to sunlight showed that all fabrics, whether white or dyed, changed somewhat in color. Unbleached fabrics became lighter and bleached undyed fabrics became grayer and more yellow. Dyed fabrics varied in the type and extent of color change, some becoming lighter, some darker, and some darker and then lighter, while others changed in tint. No one color could be said to be more fast than others. Fastness depends on the nature of the individual dye and not its hue. Fabrics dyed with vat dyes, the zephyrs and suitings, were more fast than voiles dyed with direct dyes. Dark colors appeared to fade less than light colors. Guaranteed fabrics, zephyrs and suitings, were less faded than the nonguaranteed voiles. Price did not measure fastness or retention of strength. The classifying of fadings by direct observation, giving each fabric a class number, was found unsatisfactory. It appeared that when at all possible, objective measurements of colors should be made.

The ultraviolet radiation of the sunlight at College Station was observed to be approximately one third greater than reported at Chicago, somewhat more than at San Juan, Puerto Rico, and approximately three times as much as at Honolulu, and, therefore, the sunlight at the station probably causes more tendering of fabrics and greater fading of certain dyes than at the other three localities.

The results obtained emphasized the importance of avoiding unnecessary exposure of cotton fabrics to sunlight, particularly where the ultraviolet radiation of the sunlight is great. For the least loss of strength when exposed to sunlight, a cotton fabric should be composed of unbleached, mercerized, coarse, hard twisted yarns, and if dyed, a vat dye with protective characteristics and high in concentration should be used. The desirability of buying materials guaranteed to be color fast was evident.

HOME MANAGEMENT AND EQUIPMENT

The rural homemaker in Washington County, frequency of paid work and its effects upon her and her home (*Rhode Island Sta. Rpt.* [1932], pp. 51, 52).—A brief summary is given of the analysis of the records of paid work done by 624 rural home makers in the State, including correlations between the amount of education and the cash income of the home makers.

Comparison of the methods of refrigeration in the rural home in Rhode Island (*Rhode Island Sta. Rpt.* [1932], pp. 52, 53).—A brief summary is given of a comparison of the operation costs and efficiency of temperature, both in degree and evenness, of ice refrigerators and mechanical refrigerators operated by kerosene and electricity.

A comparison of cooking equipment for the farm home (*Kansas Sta. Bien. Rpt.* 1931-32, pp. 115, 116).—This progress report summarizes the results obtained in a study of some of the factors affecting the efficiency of top burners on kerosene stoves as determined by the fuel consumption and the time required to bring water to the boiling temperature.

Higher efficiency in domestic heating, H. J. DANA and H. H. LANGDON (*Northwest Sci.*, 6 (1932), No. 3, pp. 90-97, figs. 2).—Studies conducted at the Washington State College are reported briefly. These showed that hand firing in the usual type of household furnace yields a very low over-all fuel efficiency of from 30 to 40 percent. The use of a stoker will improve this efficiency between 10 and 20 percent. Replacing the conventional furnace with an improved design of furnace having better combustion space and more adequate heat exchanger gave an efficiency of 82.5 percent, using less than half the coal to heat the same house at 33.7 percent. The addition of a hot air economizer to a conventional hot water, stoker-operated furnace, yielded an over-all average efficiency of 87.2 percent, the additional heat being extracted from the flue gases.

High efficiency, namely, 90.2 percent, was obtained during the stoker operating period, but this was reduced by the long coasting period to an average of 87.2 percent for the entire cycle, showing the desirability either of burning the fuel as fast as it is introduced, or of maintaining continuous stoker operation with varying rate of combustion.

MISCELLANEOUS

Report of the director [of Connecticut State Station] for the year ending October 31, 1932, W. L. SLATE (*Connecticut State Sta. Bul.* 347 (1933), pp. 269-288).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Annual Report [of Florida Station], 1932, W. NEWELL ET AL. (*Florida Sta. Rpt.* 1932, pp. 218+VIII, figs. 23).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Meteorological observations are also included (pp. 149, 157, 167-173), calling attention especially to the unusually mild winter of 1931-32 in the Everglades as in other parts of the country.

Forty-fifth Annual Report [of Georgia Station], 1932, H. P. STUCKEY (*Georgia Sta. Rpt.* 1932, pp. 55, figs. 16).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

[Biennial Report of Kansas Station, 1931-32], L. E. CALL (*Kansas Sta. Bien. Rpt.* 1931-32, pp. 139, figs. 3).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fortieth Annual Report [of Minnesota Station], 1932, A. BOSS (*Minnesota Sta. Rpt. 1932*, pp. 77).—In addition to data noted previously or elsewhere in this issue, this report contains abstracts of the following: Preliminary Studies of the Internal Structures of *Braula coeca* Nitzsch, by E. C. Alfonsus and E. Braun (p. 15); Breeding Wheat for Baking Quality, by C. H. Bailey and H. K. Hayes (p. 16); Free and Bound Water in Elastic and Non-Elastic Gels, by I. D. Jones and R. A. Gortner (p. 18); Thiocyanogen Number and Its Application to Studies on Lard, by L. Zeleny and C. H. Bailey (pp. 23, 24); The Inadequate Distribution of State Agricultural Experiment Station Bulletins to Foreign Countries, by J. G. Leach, H. Macy, and C. H. Bailey (p. 25); Effect on the Agglutination Reactions of Bovine Sera of Variations in Concentration of Sodium Chloride in Rapid-Test *Bact. abortus* Antigens (p. 26), The Effect on the Agglutination Reactions of Bovine Sera of Variations in Bacterial Concentration of Antigens for Use in the Rapid Agglutination Test for the Diagnosis of Bang's Disease (p. 26), The Influence of Some of the Properties of the Serum-Antigen Mixture on the Results Obtained with the Rapid Agglutination Test for Bang's Disease (pp. 26, 27), and A Study of the Occurrence of Discrepancies in the Results Obtained with the Rapid and the Test-Tube Agglutination Tests for the Diagnosis of Bang's Disease (p. 27), all by C. R. Donham and C. P. Fitch; Hypersensitiveness to Air-Borne Bee Allergen, by R. V. Ellis and H. G. Ahrens (pp. 31, 32); Paradoxical Terminology in Genetics, by F. B. Hutt (p. 35); and Is Water in Living Organisms Ordinary Water? by R. A. Gortner (p. 36).

Forty-third Annual Report [of New Mexico Station, 1932], F. GARCIA (*New Mexico Sta. Rpt. 1932*, pp. 85, figs. 9).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-fifth Annual Report of [Rhode Island Station, 1932], B. E. GILBERT (*Rhode Island Sta. Rpt. (1932)*, pp. 39–61).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Dedication of Jenkins laboratory, October 11, 1932 (*Connecticut State Sta. Bul. 345 (1933)*, pp. 185–207, figs. 3).—The papers and proceedings at the dedication exercises (E.S.R., 68, p. 139) are here given.

Publications available for free distribution (*Idaho Sta. Circ. 69 (1932)*, pp. 4).—A list of the publications available as of December 1932.

Reports on the work of agricultural research institutes and on certain other agricultural investigations in the United Kingdom, 1930–1931 (*London: Govt., 1932*, pp. 377).—In this volume is presented the progress of agricultural research conducted during the year 1930–31 at research agencies in the United Kingdom. The research report includes soils; plant nutrition, physiology, and breeding; crop varieties and seeds; horticulture and glass-house crops; entomology and plant pathology; agricultural parasitology; animal pathology, nutrition, and breeding; dairying; agricultural economics; preservation and transport; agricultural engineering; local investigations at advisory centers; and various other investigations.

A list of papers published during the year is inserted at the end of each subdivision of the report. The appendix carries a list of names and addresses of research institutes and persons in charge of investigations at other research centers.

British and Irish writers on agriculture, compiled by W. F. PERKINS (*Lymington, Eng.: Chas. T. King, 1932*, 2. ed., pp. XI–193).—This is a bibliography of about 1,300 British and Irish writers on the agriculture of the United Kingdom from the earliest printed books through the year 1900. Appendixes list over 370 anonymous books during the same period.

NOTES

Colorado College.—Dr. Barton Orville Aylesworth, president from 1899 to 1909, as well as professor of political economy and logic, died in Denver July 1 at the age of 73 years. He was a native of Illinois and had been president of Drake University, pastor of the Central Church of Christ of Denver, and a national lecturer and organizer of the National American Woman's Suffrage Association.

Iowa College and Station.—Dr. A. G. Black, head of the department of agricultural economics, has been granted leave of absence to become acting corn-hog production chief of the Agricultural Adjustment Administration of the U.S. Department of Agriculture. In this new activity he will assist in the formulation of initial policies for applying the Agricultural Adjustment Act to corn and hog production and marketing problems.

Kansas College.—The honorary D.Sc. degree was conferred at the college at its recent commencement on Frank A. Waugh '91, head of the department of landscape architecture of the Massachusetts College.

Massachusetts College.—At the recent commencement the honorary D.Sc. degree was conferred upon Dr. Joseph B. Lindsey '83 (E.S.R., 68, p. 426), and Dr. Homer J. Wheeler '83, for many years director of the Rhode Island Station.

Montana College and Station.—The legislature reduced the station appropriations from \$118,800 to \$72,517 for the coming biennium. A request for detailed soil survey work was eliminated. This curtailment has resulted in the elimination from the station work of L. P. Reitz, assistant agronomist; D. M. Feese, assistant in the grain inspection laboratory; and Theodore T. Chaddock, laboratory assistant in veterinary research. M. L. Wilson, head of the agricultural economics work in the station and extension service, has been granted indefinite leave of absence to become wheat production administrator in the Agricultural Adjustment Administration of the U.S. Department of Agriculture. Louis Vinke, head of the department of animal husbandry in the college and station, has resigned, effective July 31, to engage in commercial work.

Nevada Station.—The station reports that even though the snow surveying project is suffering temporary loss of support through failure of State legislatures to make the usual appropriations, the expansion of this activity has continued. Local appreciation of its importance has been shown by the water users of the Humboldt Basin, who despite financial problems have authorized the continuance of the snow surveys in that basin at private expense. A Western Inter-State Snow Survey Conference was recently organized at the station, which is planning to publish the proceedings of the first meeting.

West Virginia Station.—Fred E. Brooks, associate entomologist in the fruit insect investigations of the U.S. Department of Agriculture, with which he had been connected since 1911, died at French Creek, March 9, at the age of 65 years. He was a native of the State and had served as agent in the station from 1903 to 1906 and as associate entomologist from 1907 to 1911.

New Journals.—*The Empire Journal of Experimental Agriculture* is being published quarterly by Humphrey Milford, Oxford University Press, Amen House, Warwick Square, London, E.C. 4, under the management of an editorial board headed by Sir John Russell of the Rothamsted Experimental Station. It is projected as a medium for the publication of original papers dealing particularly with problems relating to crops and animal husbandry

and the results of controlled experimental work in the field arising from fundamental scientific investigation. The initial number contains the following articles: The Breeding of Early-Ripening Varieties of Spring Wheat in Canada, by L. H. Newman (pp. 3-16); The Influence of the Nutritional State of the Sheep on Its Susceptibility to Infestation with the Stomach Worm, *Haemonchus contortus*, by A. H. H. Fraser and D. Robertson (pp. 17-21); Rothamsted Experiments on Residual Values of Leguminous Crops, by H. Nicol (pp. 22-32); Methods and Scope of Soil Surveys in Western Canada, by A. H. Joel (pp. 33-42); Grassland Management and Its Influence on the Sward—Part I, Factors Influencing the Growth of Pasture Plants, by M. G. Jones (pp. 43-57); The Development of Haymaking Machinery, by W. H. Cashmore and J. E. Newman (pp. 58-67); The Influence of Artificially Dried Grass in the Winter Ration of the Dairy Cow on the Colour and Vitamin A and D Contents of Butter, by S. J. Watson, J. C. Drummond, I. M. Heilbron, and R. A. Morton (pp. 68-81); The Relation of Soils to Grain-Growing in Kent in the Thirteenth Century, by R. A. Pelham (pp. 82-84); and Investigation of Soil Profiles from Cyprus—Part I, Profiles of Soils over Limestone and Serpentine, by A. Reifenberg and E. K. Ewbank (pp. 85-96).

Herbage Reviews is being published quarterly in conjunction with *Herbage Abstracts* by the Imperial Bureau of Plant Genetics, Aberystwyth, Wales. In addition to news notes, short articles, and a bibliography on lucerne pollination, breeding, and seed setting, the initial number contains the following original articles: Research on Forage Plants at the Agricultural Experiment Station in Bari, by E. Pantanelli (pp. 1-4); The Genus *Lespedeza* in Agriculture, by A. J. Pieters (pp. 4-7); Grass Seed Production and Gall Midges, by H. F. Barnes (pp. 7-9); and Theoretical and Practical Significance of Lyssenko's Research on the Vernalisation of Agricultural Plants, by F. Favorov (pp. 9-14).

Revue Vétérinaire Slave is being published by Józef Jankowski & Co., Zielna 20, Warszawa (Warsaw), as the official organ of the Union of Slavic Veterinarians. Its purpose is to present brief abstracts of original publications and bibliographical notices of veterinary publications of the countries represented in the union, Poland, Bulgaria, Czechoslovakia, and Yugoslavia. The initial number contains about 75 abstracts. Titles are for the most part given in the Slavic languages but with translations in German, French, or English. The abstracts are mainly in German or French, with some in English.

The forthcoming publication of an *Index Veterinarius* is announced by the Imperial Bureau of Animal Health of the Ministry of Agriculture and Fisheries of Great Britain, which is located at Weybridge, Surrey, England. The first number of this index, covering material indexed by the bureau during the first quarter of 1933, is to be issued during the present summer. An annual volume, made up of four quarterly numbers, each of about 400 pages and containing about 2,500 references, is contemplated.

Miscellaneous.—Following transfer by the South Carolina State Legislature on May 13 of the State Food Research Laboratory at Charleston to the State Medical College, the trustees of the college have announced that because of heavy reductions in the appropriations continuance of the laboratory will be impossible. For some years this work has been under the direction of Dr. R. E. Remington.

Press reports announce the discontinuance of the College of Agriculture of Syracuse University, organized in 1910. A statement from the university chancellor attributes this action to a desire to avoid duplicating in considerable measure the work of the New York State College of Agriculture at Cornell University.

UNITED STATES DEPARTMENT OF AGRICULTURE

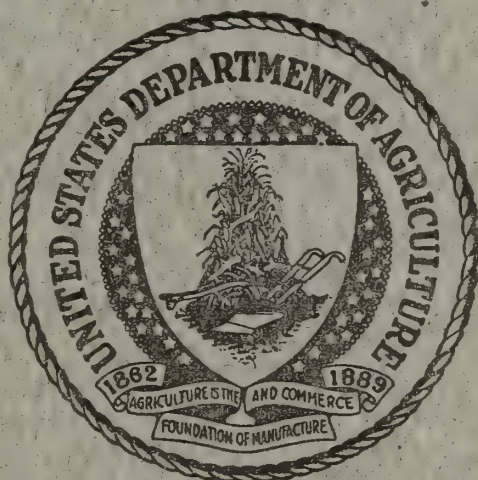
OFFICE OF EXPERIMENT STATIONS

Vol. 69

SEPTEMBER 1933

No. 3

EXPERIMENT STATION RECORD



By direction of the Secretary of Agriculture, the matter contained herein
is published as administrative information required for the
proper transaction of the public business

For sale by the Superintendent of Documents, Washington, D. C. - - - - - Price 15 cents
Subscription per volume (2 volumes a year) consisting of 6 monthly numbers and index, \$1
Foreign subscription per volume, \$1.50

EXPERIMENT STATION RECORD

Editor: HOWARD LAWTON KNIGHT

EDITORIAL DEPARTMENTS

Agricultural and Biological Chemistry—H. C. WATERMAN, SYBIL L. SMITH.
Agricultural Meteorology—W. H. BEAL.
Soils and Fertilizers—H. C. WATERMAN.
Agricultural Botany, Diseases of Plants—W. E. BOYD, J. W. WELLINGTON,
H. M. STEECE.
Genetics—H. M. STEECE, J. W. WELLINGTON, G. HAINES.
Field Crops—H. M. STEECE.
Horticulture and Forestry—J. W. WELLINGTON.
Economic Zoology and Entomology, Veterinary Medicine—W. A. HOOKER.
Animal Husbandry, Dairying, and Dairy Farming—H. W. MARSTON.
Agricultural Engineering—R. W. TRULLINGER.
Agricultural Economics—F. G. HARDEN, B. YOUNGBLOOD.
Rural Sociology—B. YOUNGBLOOD, F. G. HARDEN.
Agricultural and Home Economics Education—F. G. HARDEN.
Foods and Human Nutrition—SYBIL L. SMITH.
Textiles and Clothing—H. M. STEECE, SYBIL L. SMITH.
Home Management and Equipment—
Indexes—MARTHA C. GUNDLACH.
Bibliographies—CORAL L. FELDKAMP.

CONTENTS OF VOL. 69, NO. 3

Editorial:	Page
Appropriations available to the Federal Department of Agriculture	321
Recent work in agricultural science	323
Agricultural and biological chemistry	323
Agricultural meteorology	332
Soils—fertilizers	333
Agricultural botany	341
Genetics	344
Field crops	353
Horticulture	364
Forestry	370
Diseases of plants	372
Economic zoology—entomology	381
Animal production	400
Dairy farming—dairying	412
Veterinary medicine	420
Agricultural engineering	437
Agricultural economics	442
Rural sociology	458
Agricultural and home economics education	459
Foods—human nutrition	460
Textiles and clothing	475
Home management and equipment	477
Miscellaneous	477
Notes	478

EXPERIMENT STATION RECORD

VOL. 69

SEPTEMBER 1933

No. 3

EDITORIAL

APPROPRIATIONS AVAILABLE TO THE FEDERAL DEPARTMENT OF AGRICULTURE

For many years it has been the custom in these columns to summarize briefly the current legislation making provision for the Federal Department of Agriculture. Normally this discussion is based on the agricultural appropriation act covering the new fiscal year. Under present conditions, however, the situation is much more complicated, and such estimates as now seem possible are dependent in large degree upon other legislation and subject to the possibility of later revision.

According to a statement recently issued by the Department, its cash withdrawals from the Treasury during the fiscal year ending June 30, 1934, will be limited to \$60,189,538. This amount is available for the regular work of the Department and for Federal aid to the States for experiment stations, extension work, and forestry, but does not include the very substantial allotments for roads, permanent construction under the various recovery acts, or the expenditures under the Agricultural Adjustment Act. It is comparable with appropriations aggregating \$81,879,556 for the previous fiscal year, and represents a reduction by the President under special powers conferred upon him by Congress of \$15,154,569 from the appropriations made by the Seventy-second Congress in an act approved March 3, 1933. It is a reduction of 37 percent as compared with the corresponding appropriations for the fiscal year 1932. The allotments for research in the two years are estimated at about \$17,000,000 and \$11,000,000, respectively, a reduction of 35 percent.

Of the total amount still available \$42,794,618 is allotted to what are termed the ordinary activities of the Department. The remainder includes \$9,839,322 for payments to the States for experiment stations and extension work and \$7,555,598 for anticipated deficiencies in fighting forest fires and similar items.

The allotments to the various bureaus and offices of the Department represent an aggregate decrease of \$15,834,507 from the previous year. About half of this amount is accounted for by the 15 percent reduction in all salaries which has been effective since April 1, 1933, and the remainder is expected to be absorbed mainly by additional furloughs without pay, nonfilling of vacancies, curtailment, suspension, or discontinuance of lines of work, and other economies.

The reductions have been apportioned among the bureaus and offices in varying degree. The Bureau of Animal Industry is allotted \$11,778,135, a reduction from \$15,324,947; the Forest Service \$7,645,559 as compared with \$10,780,924; and the Bureau of Agricultural Economics \$4,497,150, a reduction of \$2,152,691, mainly because of radical curtailments in the Market News Service. For the Bureau of Plant Industry \$3,728,195 is allotted, as compared with \$4,930,874 for the previous year. Other reductions include the Weather Bureau from \$4,164,038 to \$2,909,884; the Bureau of Plant Quarantine from \$2,490,125 to \$1,797,694; the Bureau of Entomology from \$2,471,700 to \$1,729,241; the Food and Drug Administration from \$1,716,167 to \$1,493,000; the Bureau of Chemistry and Soils from \$1,925,080 to \$1,470,305; the Extension Service from \$1,688,170 to \$1,189,267; the Office of the Secretary from \$1,206,547 to \$1,029,442; the Bureau of Biological Survey from \$1,756,177 to \$1,017,261; and the Office of Information, including the Department's printing funds, from \$1,335,800 to \$916,966. For the smaller units the reductions are for the Bureau of Dairy Industry from \$717,448 to \$545,000; the Bureau of Agricultural Engineering from \$618,690 to \$423,971; the Bureau of Home Economics from \$233,365 to \$169,338; the Grain Futures Administration from \$218,838 to \$166,639; and the Library from \$106,100 to \$88,901.

The Office of Experiment Stations is allotted \$198,670, an apparent reduction from \$294,294, but of the latter amount \$30,000 was provided for the liquidation of the Alaska, Guam, and the Virgin Islands Stations in 1932. The significant reduction is \$45,622, or slightly under 17 percent.

The item previously mentioned of \$9,839,322 for the payments to the States for experiment stations and extension work has been computed as a 25 percent reduction from the 1934 appropriations in conformity with the terms of an Executive order issued by the President on June 10, 1933. The quota payable on July 1, 1933, under these appropriations was, however, met in full, and on July 26 a further Executive order deferred the effective date for the enforcement of the previous order until March 21, 1934. This postponement affords 60 legislative days for consideration of the matter by Congress as proposed in a joint resolution passed by the Senate on June 15, 1933. Should subsequent installments for the year ultimately be made on the basis of the appropriation act, the experiment stations would receive \$4,381,000 and the extension services \$8,738,096. These are the full amounts authorized under the Hatch, Adams, and Purnell Acts, the various extension measures, and supplementary legislation extending the acts in whole or in part to the Territories and other possessions of the United States.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Colloid chemistry, theoretical and applied.—III, IV, Technological applications, edited by J. ALEXANDER (*New York: Chem. Cat. Co., 1931, vol. 3, pp. 655, figs. 164; 1932, vol. 4, pp. 734, figs. 116*).—Volumes 3 and 4 of this work (E.S.R., 55, p. 709; 60, p. 410) are designated the first and second series, respectively, of papers on technological applications.

Volume 3 contains 42 papers, among them the following: Cohesion and Adhesion, by J. W. McBain and J. Alexander (pp. 9–26); Some Practical Results of X-ray Researches on Colloids, by G. L. Clark (pp. 27–40); Wetting of Solids by Liquids, by F. E. Bartell (pp. 41–60); Spontaneous Dispersion of Small Liquid Particles, by N. Rashevsky (pp. 61–64); The Influence of Elasticity and Permeability on the Swelling of Two-Phase Systems, by K. von Terzaghi (pp. 65–88); On the Rubber-like and Liquid-Crystalline States of Matter, in Connection with the Classification of Crystals and Molecules According to Their Vectorial Fields, by P. P. von Weimarn (pp. 89–102); Surface and Catalysis, by E. F. Armstrong (pp. 103–106); Contact Catalysis, by H. S. Taylor (pp. 107–118); Adsorption by Silica Gel, Theory and Applications, by E. B. Miller (pp. 119–134); Colloid Factors in Water Supply, by W. D. Turner and D. D. Jackson (pp. 135–156); Crushing and Fine Grinding of Quartz, by L. Navias (pp. 157–178); Colloid Mills and Comminution Chemistry, by A. Chwala (pp. 179–188); Suspensoids and Their Electrical Precipitation, by W. W. Strong (pp. 189–206); The Super-Centrifuge in Industry, by E. M. James (pp. 207–214); Notes on Filtration, with Special Reference to Metafiltration, by J. A. Pickard (pp. 215–224); The Flotation Process, by G. H. Buchanan (pp. 225–238); Colloid Chemistry and Geology, by R. E. Liesegang (pp. 251–260); Colloidal Minerals, by C. Doelter (pp. 261–282); Some Colloidal Properties of Sodium Silicate Solutions, by W. Stericker (pp. 289–296); The Colloidal Nature and Properties of Cements and Mortars, by A. B. Searle (pp. 357–412); The Properties of Thin Films on Metals, by U. R. Evans (pp. 473–476); The Colloids and the Corrosion of Iron, by J. N. Friend (pp. 477–490); Soil Colloids, by J. di Gleria and F. Zucker (pp. 559–568); The Colloidal Chemistry of the Soil, by R. Bradfield (pp. 569–590); Rapid Colloidal and Mechanical Analysis of Soils, by G. J. Bouyoucos and M. M. McCool (pp. 591–596); and The Colloid Chemistry of Wheat, Wheat Flour, and Wheat Flour Products, by R. A. Gortner (pp. 597–626).

Volume 4 also contains 42 papers, among them Colloid Chemistry of Cellulose, by M. Samec (pp. 7–66); Colloid Chemistry of Wood and Wood-Formation, by H. Wislicenus (pp. 67–74); Cellulose Esters, by E. W. J. Mardles (pp. 87–100); Colloid Chemistry in the Sugar Industry, by R. T. Balch and H. S. Paine (pp. 137–162); Applied Colloidal Chemistry in Confectionery Manufacture, by S. Jordan (pp. 163–166); A Summary of the Colloid Chemistry of Starches, by M. Samec (pp. 167–186); Starch and Some of Its Derivatives, by V. G. Bloede (pp. 187–192); Sizing and Finishing of Textile Materials, by L.

A. Olney (pp. 193-196); The Process of Dyeing, by G. Georgievics (pp. 197-204); Dyeing, by W. Harrison (pp. 205-218); Theory of Dyeing, by W. D. Bancroft (pp. 219-234); Synthetic Resins, by H. L. Bender (pp. 351-362); Dispergation and Aggregation of Natural Silk in Aqueous Solutions of Neutral Salts, by P. P. von Weimarn (pp. 363-398); Technologically Useful Properties of Casein, by F. L. Browne (pp. 399-414); Notes on Colloidal Phenomena in Paint and Varnish Products, by H. A. Gardner (pp. 477-494); Colloidal Aspects of Paint and Varnish Removers, by N. Boehmer (pp. 495-498); Colloidal Aspects of Baking Chemistry, by C. N. Frey and Q. Landis (pp. 539-578); Butter and Margarine from the Standpoint of Colloid Chemistry, by W. Clayton (pp. 579-588); The Pectic Substances, by R. Johnstin and M. A. Griggs (pp. 601-616); Alkaline and Other Detergents, by H. G. Elledge (pp. 635-652); The Colloid Chemistry of Washing, by L. Zakarias (pp. 653-666); and Colloidal Aspects of Waste Treatment, by A. M. Buswell (pp. 669-695).

A carotene derivative giving with antimony trichloride an absorption band at 610-630 $m\mu$, M. VAN EEKELEN and A. EMMERIE (*Nature [London]*, 131 (1933), No. 3304, p. 275).—A carotene derivative has been prepared which gives the same absorption band in the antimony trichloride reaction as vitamin A, but is devoid of growth-promoting activity. The method consisted in boiling 150 mg of carotene for 15 minutes with a mixture of 100 cc of acetone and 1 cc of hydriodic acid (sp. gr. 1.7), cooling to room temperature, adding 150 cc of petroleum ether, and removing the acetone by washing with water. When the petroleum ether solution is shaken vigorously with strong sodium thiosulfate solution and treated with antimony trichloride in chloroform (with the addition of 1 drop of anhydrous acetic acid), a blue color develops with an absorption down to 640 $m\mu$. On adding to the petroleum ether solution 20 cc of 1 percent sulfuric acid and shaking with small quantities of a 1 percent sodium nitrite solution and testing from time to time with the antimony trichloride reagent, a strong absorption band at from 610 to 630 $m\mu$ appears, maximum absorption being reached at a point at which the color of the petroleum ether solution has almost disappeared.

Physiological studies of the butyl-acetone group of bacteria.—I, Gelatinolysis, C. H. WERKMAN and G. L. STAHLY (*Iowa State Col. Jour. Sci.*, 7 (1933), No. 2, pp. 93-109, pl. 1, figs. 4).—For the testing of cultures of bacteria for their capacity to liquefy gelatin, the authors of this contribution from the Iowa Experiment Station found three methods—namely, the formation of white precipitate when acidified mercuric chloride solution was added to undecomposed gelatin, the use of a culture-tube viscometer, and the determination of the maximum temperature of gelation—to agree among themselves. Of the relative usefulness of two of these methods it is noted that “the modified mercury-protein precipitation method has given very satisfactory results in our hands and is simple and convenient. The use of the culture-tube viscometer is likewise to be recommended. This method gives excellent results and provides for the determination of the progress of gelatinolysis with time. For cultures growing at 37° C. over a period of 48 hours, no rejuvenation is necessary. Before using the culture-tube viscometer at incubation temperatures below 37°, it would be necessary to determine whether rejuvenation is required. Should rejuvenation be necessary at 50° for 10 to 20 minutes, it would, of course, prevent taking readings at intervals.” Of the gelatin temperature method it is recorded that “it may be concluded that nonliquefying cultures do not change the maximum temperature of gelation during 3 days’ growth at 37°.”

The behavior in these tests of 22 species and strains of the butyl-alcohol-acetone group of bacteria is recorded.

Direction of microbial lipase by copper soap formation, J. A. BERRY (*Jour. Bact.*, 25 (1933), No. 4, pp. 433, 434).—The author of this contribution from the U.S.D.A. Bureau of Plant Industry utilized copper soap formation as a test for lipatic activity by adding to each tube of standard nutrient agar 0.5 cc of a suitable oil or melted fat (for example, melted butter of good quality), sterilizing in the usual way, and pouring the well mixed medium at 45° C. into Petri dishes. The test itself consisted in the incubation for 48 hours at a suitable temperature of streak inoculations, the growth period being followed by the flooding of the plate with saturated aqueous copper sulfate, and carefully rinsing with water after 10 minutes. Bluish green streaks of the insoluble copper soap appearing on the plate indicate a lipolytic activity of the extent of which the intensity of the color was found to serve as a rough index. Cottonseed oil or soybean oil could be used in place of the butter.

"Among organisms giving positive tests are *Staphylococcus aureus*, *S. albus*, *Sarcina lutea*, *Pseudomonas fluorescens*, *Penicillium expansum*, and other molds.

Among the negative organisms are *Escherichia coli*, *Bacillus subtilis*, *B. mycoides*, and yeasts generally."

Characteristics of highly active vitamin A, F. H. CARR and W. JEWELL (*Nature [London]*, 131 (1933), No. 3299, p. 92).—The authors announce briefly the preparation by the help of a high vacuum distillation technic of a much more active concentrate of vitamin A than hitherto prepared, as noted in papers by Karrer et al. (E.S.R., 68, p. 151) and Heilbron et al. (E.S.R., 68, p. 723). The fraction, boiling between 136° and 137° C., had an antimony trichloride blue value of 78,000 as compared with 65,000 reported by Heilbron et al. The spectrophotographic figures were also high. Ultimate analysis gave values of C 83.5 percent and H 10.6 percent, which are in excellent agreement with the theoretical values of 83.9 and 10.5 percent, respectively, required for the formula $C_{20}H_{30}O$ suggested by Karrer. In rat feeding tests 0.0006 mg daily gave slightly better growth than 0.001 mg (one unit) of international standard carotene. This dosage also cured xerophthalmia.

Ultra-violet absorption spectrum and chemical structure of vitamin B₁ (*Nature [London]*, 130 (1932), No. 3290, pp. 773, 774, fig. 1).—This communication includes a brief report by F. F. Heyroth and J. R. Loofbourow of studies of the absorption spectra of various vitamin B₁ concentrates and the comments upon this report by F. P. Bowden and C. P. Snow, whose earlier report on the photochemistry of the vitamins has been noted (E.S.R., 67, p. 500).

The concentrates examined in the present investigation included four vitamin B₁ concentrates prepared in the authors' laboratory, three supplied by other workers, and three reported by Guha (E.S.R., 66, p. 707) and by Windaus et al. (E.S.R., 67, p. 101). With the exception of two relatively inactive concentrates with high absorption in the region of 2,600 Å, a good degree of correlation was found between the activity and the absorption in this region.

"The type of absorption thus attributed to vitamin B₁ resembles most closely, of the nitrogenous heterocyclic compounds which have thus far been investigated, the absorption of pyrimidine-ring-containing compounds, or of compounds of the type of ergothioneine. The absorption curve of the sulfur-containing Windaus preparation, the most active of those considered, is in fact very similar to that of uracil or other pyrimidines. The molecular extinction coefficient of the Windaus preparation at 2,600 Å, as calculated from the empirical formula of Windaus, is 8,225, and, as calculated from the formula of Van Veen, is 8,925. That of uracil at the same wave length is 9,500."

The antineuritic vitamin, II-VI [trans. title], A. G. VAN VEEN (*Rec. Trav. Chim. Pays-Bas*, 50 (1931), Nos. 2, pp. 200-220; 5, pp. 610-616; 51 (1932), No. 2,

pp. 265-272, 279-283).—In continuation of the investigation noted from a preliminary report (E.S.R., 65, p. 311), five papers are presented.

Paper 2 (pp. 200-207) deals with the Jansen and Donath method of concentrating vitamin B from rice polishings through the stage of adsorption by "acid clay" and liberation of the active material by barium hydroxide.

In the third paper (pp. 208-220), entitled *The Constituents of the Extract from Activated Acid Clay*, the results are reported of fractional precipitation of the extract from acid clay with silver nitrate and barium hydroxide at varying H-ion concentrations.

The fourth paper (pp. 610-616) is concerned with the purification of the silicotungstic acid fraction by successive treatments with aqueous platinum chloride, aqueous gold chloride, and alcoholic cadmium chloride and the use of aromatic acids and sulfonic chloride to remove the impurities. The final separation of the active material was as a crystalline hydrochloride with the same melting point and properties as that obtained by Jansen and Donath.

Paper 5 (pp. 265-272), entitled *The Empirical Formula of the Antineuritic Vitamin*, reports the analysis of the crystalline hydrochloride obtained in the previous study. An empirical formula of $(C_6H_{10}O_2N_2HCl)_x$ is proposed, but the possibility is suggested that the crystalline substance is not the vitamin itself but a provitamin which is converted into the vitamin in the animal body.

In paper 6 (pp. 279-283), entitled *The Properties of the Antineuritic Vitamin from Rice Bran*, the author summarizes the chemical properties of the crystalline hydrochloride.

The crystalline preparation of vitamin B from yeast and rice bran, I [trans. title], A. G. VAN VEEN (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 208 (1932), No. 1-3, pp. 125-128).—In this paper, which is the seventh in the series noted above, the author reports biological and chemical comparisons of samples of the crystalline vitamin B hydrochloride prepared by Windaus and associates from yeast (E.S.R., 67, p. 101) and his own crystals from rice bran. Both preparations had identical activity when tested on rice birds. The hydrochlorides, chloroaurates, and picrolonates of both had identical melting points, but on analysis the author's preparation gave values corresponding most closely with an empirical formula of $C_{12}H_{20}O_2N_4S$ for the free base, a formula differing slightly from that of Windaus.

The sulfur is thought to be combined otherwise than in cystine or cysteine.

The antineuritic vitamin from rice bran.—VIII, The antineuritic vitamin from rice bran and polyneuritis in experimental animals [trans. title], A. G. VAN VEEN (*Meded. Dienst Volksgezondh. Nederland. Indië*, 21 (1932), No. 4, pp. 184-195).—In this continuation of the series noted above, tests are reported of the activity of crystalline preparations of vitamin B (B_1) for rice birds, pigeons, and rats and interpreted in terms of activated clay, the international standard for vitamin B (E.S.R., 66, p. 690). It is concluded that 100 units of the standard clay have the same activity as 0.4 mg of the crystalline vitamin. For protection against polyneuritis from 0.4 to 0.5 international unit is required for rice birds, from 2 to 3 units for pigeons, and from 1 to 2 units for young rats.

Potency of vitamin B_1 preparations, H. W. KINNERSLEY, J. R. P. O'BRIEN, and R. A. PETERS (*Nature [London]*, 130 (1932), No. 3290, p. 774).—Comparative pigeon tests (curative) are reported for crystalline specimens of vitamin B (B_1) prepared by the authors' method (E.S.R., 68, p. 725) and the crystals of Windaus et al. (E.S.R., 67, p. 101), with results showing that crystals prepared by the authors' technic were $1\frac{3}{4}$ times as potent as those of Windaus. It is concluded that the preparation of Windaus cannot be pure vitamin B.

Indophenol reducing capacity of lemon juice and its fractions in relation to vitamin C activity, S. S. ZILVA (*Nature [London]*, 131 (1933), No. 3306, p. 363).—A reply to the comments of Dann noted previously (E.S.R., 69, p. 169).

On the sulfur content of the hemoglobin of human blood [trans. title], Z. ASZÓDI (*Biochem. Ztschr.*, 252 (1932), No. 4-6, pp. 387-391).—The author determined the sulfur content of hemoglobin preparations made from the blood of 32 patients showing various conditions specified in the table of results submitted, and reached the conclusions (1) that the hemoglobin of human blood contains about 0.65 percent of sulfur, and (2) that the red blood corpuscles of human blood may contain hemoglobins of various sulfur contents.

Cataphoresis: An improved cylindrical cell, S. MATTSON (*Jour. Phys. Chem.*, 37 (1933), No. 2, pp. 223-227, fig. 1).—A new form of cataphoresis cell described in this contribution from the New Jersey Experiment Stations is a modification of the author's former design (E.S.R., 60, p. 410), and has as one of its important advantages over the former style of construction the much greater ease with which the cell may quickly and thoroughly be cleaned. The electrodes are prevented from interfering with the cleaning by being made in the form of cones sealed to the walls of exactly fitted conical expansions or electrode chambers at the ends of the tube. Further, this construction permitted the relatively large electrode area necessary to prevent the appearance of gas bubbles.

The paper contains also a brief discussion of some mathematical features of cataphoretic measurements.

The measurement of organic impurities in sands by means of a photo-electric cell, H. W. LEAVITT and W. S. EVANS (*Maine Technol. Expt. Sta. Bul.* 28 (1932), pp. 12, figs. 3).—The color intensity of dilute sodium hydroxide extracts of sand samples was measured in a simple, readily standardized photo-electric cell apparatus, replacing the usual ocular comparison with temporary or permanent color standards. The construction and manipulation of the device are given in detail. The new procedure gave a wide range of readings to cover plate colors from plate 0 to plate 4.5, very accurate readings, and almost perfect check readings. It was found not subject to any personal equation of the operator. The necessary apparatus could be installed in any laboratory at small expense, and the method gave a high correlation with the old field test so that accurate conversions can be made if desired.

A simple, inexpensive electron tube potentiometer for use with the glass electrode, L. D. GOODHUE, L. H. SCHWARTZ, and E. I. FULMER (*Iowa State Col. Jour. Sci.*, 7 (1933), No. 2, pp. 111-118, figs. 2).—A simplified circuit for an electron tube potentiometer for use with the glass electrode is described as composed of standard units which can readily be obtained at small cost. The equipment "makes use of the common vacuum tube UX 232, which is inexpensive and can be obtained at any radio supply shop. Circuits previously described in the literature generally involve the use of the more expensive types of vacuum tubes, complex circuits, and elaborate shielding. The equipment described can be used with almost any type of potentiometer and fairly sensitive galvanometer and can be made compact to form a portable unit. The structure and operation are so simple that the apparatus is suitable for routine laboratory use."

Electron tube potentiometer for the determination of redox potentials, C. H. WERKMAN, C. A. JOHNSON, and H. D. COILE (*Iowa State Col. Jour. Sci.*, 7 (1933), No. 2, pp. 163-175, pl. 1, figs. 7).—The authors describe three electron tube potentiometers found to be suitable for the determination of oxidation-reduction potentials in bacterial cultures, the apparatus using inexpensive elec-

iron tubes obtainable from radio dealers. "The apparatus has been in use for several months and gives consistent and reproducible readings."

Soil testing: A practical system of soil diagnosis, C. H. SPURWAY (*Michigan Sta. Tech. Bul. 132 (1933), pp. 16, pls. 8*).—The bulletin gives working directions for the preparation and use of reagents for semiquantitative tests of soil extracts for nitrates, phosphates, potassium, calcium, carbonates, ammonia, nitrites, magnesium, iron, aluminum, manganese, sulfates, chlorides, and sodium, prescribing as a general extracting reagent a solution of one part of pure acetic acid in three parts of distilled water. Color charts included in the bulletin are to be used for classifying the results into the four indications as blank, low, medium, and high. For the white precipitates obtained in the chloride, sulfate, and calcium tests, the method is nephelometric, the shell vial containing the test mixture being placed upon a square of a standard deep red on the lighter color seen through the column of white suspension matched to squares of shades lighter than that of the full color, to which are attached the semiquantitative grades above noted, together with the approximate indications of the parts per million and pounds per acre 6 in. of soil, as is also done in the case of strictly colorimetric tests. In some of the tests the grades low or medium are subdivided into two indications numerically evaluated into parts per million and pounds per acre, and in some instances the descriptive discussions are omitted and only the numerical approximations given.

Rapid chemical methods for the estimation of the capacity of the soil to supply phosphoric acid to plants, G. S. FRAPS and J. F. FUDGE (*Jour. Amer. Soc. Agron., 25 (1933), No. 3, pp. 217-230*).—At the Texas Experiment Station chemical methods for estimating the capacity of the soil to supply phosphoric acid, consisting of two laboratory and two field methods, were compared with a new rapid colorimetric method devised by the authors, with the regular volumetric method using 0.2 N nitric acid, and with the results of pot experiments with 146 soils. The Hi-lo-fosphate field method of Bray (*E.S.R., 62, p. 13*) gave erratic results on the same soil at different times and was not reliable. The colorimetric citric acid method was slow and exacting and tended to give erratic results. The other methods tested were found to be erratic to a certain extent, but gave satisfactory results when properly controlled and checked and were rapid in operation. Results obtained by the several methods for most of the soils agreed quite well, indicating that the same phosphates were being brought into solution. The colorimetric Truog method (*E.S.R., 64, p. 312*) did not remove as much phosphoric acid from soils high in soluble phosphoric acid as did the two 0.2 N nitric acid methods and the colorimetric citric acid method. Usually in such cases, the Truog method was in best agreement with the pot experiments.

Results obtained by the 0.2 N nitric acid methods (regular and colorimetric) and the colorimetric Truog method agreed quite well with the results of the pot experiments as measured by the phosphoric acid removed by crops. "The relation of the colorimetric citric acid method to the results of the pot experiments was regular but not as close as with the above methods. The Truog-LaMotte method was fairly closely related to the results of the pot experiments on soils which gave low amounts of phosphoric acid to the crops, after which the relations were irregular. The Truog-LaMotte method seems to be much more reliable for field work than the Hi-lo-fosphate method. Extreme care must be taken at all times with all of the colorimetric methods to prevent erroneous results due to impurities in the reagents or other causes of error."

Comparison of methods for estimating available phosphorus in alkaline calcareous soils, R. D. HOCKENSMITH, R. GARDNER, and J. GOODWIN (*Colorado*

Sta. Tech. Bul. 2 (1933), pp. 24).—The Winogradsky method in the special case of calcareous alkaline soils gave, of 67 fields which did not respond to phosphate fertilizer, indications ranging from no visible growth of *Azotobacter* (3 percent of the samples) through the very deficient (25.4 percent), moderately deficient (28.3 percent), and slightly deficient (35.8 percent) to sufficient phosphate in 7.5 percent of the cases examined. Of 21 soils known to respond strongly to phosphate treatment, the *Azotobacter* test indicated 42.9 percent to be very deficient, 33.3 percent to be moderately deficient, 14.3 percent to be slightly deficient, 0 percent to be sufficient; and 9.5 percent gave no visible growth of *Azotobacter* colonies.

With the Truog method (E.S.R., 64, p. 312), the agreement with field trials for the "sufficient" soils was 73.9 percent, while for the soils which gave a great response in the field the agreement was 78.9 percent. The Dahlberg-Brown method (E.S.R., 67, p. 652) gave an agreement with the "sufficient" soils of 84.6 percent, while for the soils which gave a great response the agreement was 63.2 percent. The potassium carbonate method of Das (E.S.R., 64, p. 115) gave an agreement with the "sufficient" soils of 90 percent, while for the soils which gave a great response in the field, the agreement was 90.5 percent. "If, however, the data are calculated in a different way and the soils which gave a slight response are included with those which gave a great response, the agreement for the deficient soils drops from 90.5 percent to 73.1 percent."

Of the methods studied, the potassium carbonate method appeared to give the highest agreement with field results. "It seems probable that no chemical method for estimating the availability of soil phosphorus can imitate exactly the power which plants have for securing available phosphorus. The data show, however, that there is a fairly close relationship between the amount of phosphorus soluble in certain solvents and the amount which is available to plants. An alkaline solvent appears to be more satisfactory for alkaline calcareous soils than an acid extractant. The results . . . indicate that even though a laboratory test shows the soil to be deficient in available phosphorus, a field trial should be strongly recommended before a large quantity of fertilizer is purchased. A tentative procedure for the potassium carbonate method is given."

Colorimetric methods for the determination of readily available phosphorus in soils, C. O. ROST and R. M. PINCKNEY (*Jour. Amer. Soc. Agron.*, 24 (1932), No. 5, pp. 377-395).—The authors of this contribution from the Minnesota Experiment Station compared the Truog method (E.S.R., 64, p. 312), the Bray method (E.S.R., 62, p. 13), and a commercial adaptation of Truog's application of the Denigès reaction (E.S.R., 44, p. 611), among themselves and with the actual field responses of the soils examined.

The results given by the three methods showed a good agreement among themselves, indicating that in 9 of the 10 fields the readily available phosphate was rather low. The least concentration appeared in the surface soil, the greatest at a depth of 20 in. Of the comparison with field trial results it is stated that "with the Illinois test, 69 percent of the plats testing low and doubtful responded to phosphate, while 67 percent of those testing medium and 27 percent of those testing high also responded. Using the surface soil only, the percentage of responsive plats testing low was increased slightly, but for those testing doubtful, medium, and high it was decreased. When tested by the Wisconsin method, plats carrying 25 lb. or less per acre of readily available phosphorus at the surface responded to superphosphate in 69 percent of the cases and in 73 percent of the cases of those carrying between 26 and

50 lb. Nine of the 10 plats carrying more than 50 lb. failed to respond. The results secured with the La Motte-Truog test were not materially different from those secured with the Wisconsin method. The percentage of plats responding to superphosphate and carrying 50 lb. or less of available phosphorus was slightly lower, while for those carrying more than 50 lb. it was approximately the same. Using tests of surface samples only, predictions of phosphate deficiencies would be about as reliable as when subsoil samples were included. This would apply to all three methods, but especially to the Wisconsin and La Motte-Truog methods."

Standard methods for the examination of water and sewage, A. WOLMAN, M. PIRNIE, and H. E. JORDAN (*New York: Amer. Pub. Health Assoc., 1933, 7. ed., pp. XXI+180, fig. 1*).—The editors note the development of numerous new methods and modifications of methods since the appearance of the sixth edition (E.S.R., 55, p. 410), and they have adjudged some of these newer procedures as standardized sufficiently to justify their inclusion in the present edition. Also some procedures included in the previous edition have been discontinued in the present revision.

An iodometric micro method for the determination of chlorides [trans. title], N. BEREND (*Biochem. Ztschr., 252 (1932), No. 4-6, pp. 362-365*).—The solubility of silver chloride was reduced from 0.0134 mg in the 10 cc of solution in which the determination was carried out to less than 0.001 mg by working in dilute nitric acid solution containing 20 percent by volume of alcohol. Excess of a standard solution of silver nitrate was added, and, silver iodate having been shown also to be quantitatively insoluble in dilute nitric acid in the presence of 20 percent by volume of alcohol, the excess silver nitrate was determined by adding standard potassium iodate and titrating the iodate content of the filtrate, in the presence of potassium iodide sufficient for complete reaction with all of the iodate, with standard sodium thiosulfate solution. Since each atom of chlorine originally present results in the setting free of six atoms of iodine in the final reaction, the claim is advanced that the procedure is six times as sensitive as that of Volhard.

Full detail is given. The silver nitrate and sodium thiosulfate solutions used were 0.01 N, the iodate solution 0.06 N.

A convenient method for the determination of very small quantities of bromides in the presence of a large excess of chlorides [trans. title], F. HARTNER (*Hoppe-Seyler's Ztschr. Physiol. Chem., 214 (1933), No. 3-4, pp. 179-183, fig. 1*).—The author, finding that the action of potassium permanganate is likely to extend to the chloride as well as the bromide in a mixture of the two, and that even an hour of aeration does not necessarily carry over quantitatively all of the bromine into the absorption solution, was able to obtain better results by working with a rather weakly acid solution, adding manganese sulfate, setting free the bromine in a strong solution of a salt (preferably sodium sulfate), and, near the end of the process, setting free in the reaction mixture itself any such indifferent gas as, for example, carbon dioxide. Details of a procedure based upon these principles and of an apparatus adapted to the convenient working of the method are given.

A new and simplified colorimeter especially designed for the colorimetric estimation of manganese by the periodate method, G. F. SMITH and V. R. SULLIVAN (*Jour. Chem. Ed., 9 (1932), No. 8, pp. 1461-1471, figs. 6*).—The special feature of the instrument described in this contribution from the University of Illinois consists in the use of outlet stopcocks at the bases of the tubes as a means of adjusting the depth of liquid column through which the light

passes to the comparator eyepiece. The last-named part of the apparatus is also to some extent simplified. The color match having been obtained as above indicated, the heights of the two columns are read from millimeter divisions on the tubes. Full details of the construction, operation, and testing of the device are given, together with photographs and drawings.

A new volumetric determination of sodium in blood serum [trans. title], S. RUSZNYÁK and E. HATZ (*Biochem. Ztschr.*, 252 (1932), No. 4-6, pp. 414-419).—The sodium was precipitated by adding Kolthoff's reagent (E.S.R., 58, p. 608) in known excess, and after one half hour, during which time the precipitation was found to be completed, filtering off the sodium zinc uranyl acetate, adding a known excess of a standard solution of disodium hydrogen phosphate, and finally titrating the excess phosphate with standard uranyl acetate solution, cochineal as indicator. Detailed information with respect to (1) preparation of reagents, (2) deproteinization of the sera, (3) removal of the phosphate, and (4) the precipitation of the sodium, the determination of the excess of the precipitant, and the calculation of the result is given.

The determination of thymonucleic acid by means of fuchsine sulfurous acid [trans. title], T. CASPERSSON (*Biochem. Ztschr.*, 253 (1932), No. 1-3, pp. 97-111, figs. 5).—Thymonucleic acid was found quantitatively determinable by the application of the fuchsine sulfurous acid reaction after acid hydrolysis. The effects of various factors and experimental conditions upon the hydrolysis and the color development were determined, and the optimum conditions are given. By means of an analysis of the hydrolyzed and color development curves it was ascertained that the reaction proceeds in two stages, and that further increases in color intensity beyond the color obtained under the conditions here given as optimum are not to be expected.

For best results the hydrolysis should be carried out at pH 2.3 and at a temperature of 100° C., and should be continued for from 3 to 4 hours. The color readings should be made after from 3 to 6 hours. The pH value during color development should, for maximum intensity, be from 2.3 to 2.6, since at higher pH values (about pH 3) a coloration of the reagent itself appears. The sample should contain from 0.5 to 10 mg of thymonucleic acid, but quantities as small as 0.1 mg could be determined. More than 10 mg necessitated increasing quantities of reagents and thereby introduced certain inconveniences.

On the microanalytical determination of picrolonic acid with the aid of acridine [trans. title], H. SCHIEDEWITZ (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 214 (1933), No. 3-4, pp. 177, 178).—The author notes the comparatively slight difference in elementary composition between picrolonic acid and most of the biochemically important bases for the identification of which the acid is used, with the concomitant difficulty in distinguishing between mono- and dipicrolonates; and further points out that although bromopicrolonic acid permits the desired sharpness of distinction between mono- and di-salts, the brominated acid is difficult to obtain in quantities sufficient for preparation work. For these reasons he proposes to dissolve from about 6 to about 12 mg of the picrolonate in question with the help of 1 cc of dilute hydrochloric acid in 20 cc of hot water, and to precipitate acridine picrolonate by adding 15 cc of a 0.3 percent acridine solution acidified with hydrochloric acid, the voluminous precipitate of acridine picrolonate being filtered off by means of a micro filter, washed with 40 cc of water, dried for 1.5 hours at from 120° to 130° C., and weighed. Satisfactory figures for the picrolonic acid content of 9 salts of biochemically important bases are shown.

AGRICULTURAL METEOROLOGY

Report of the Chief of the Weather Bureau, 1931-32 (*U.S. Dept. Agr., Weather Bur. Rpt. 1932, pp. IV+129, pls. 4*).—This report follows the plan of previous years except that the usual account of administrative activities and some tabular matter are omitted. It contains a general summary of the weather conditions for each month of 1931, including tornadoes, hail, losses from windstorms, sunshine, and evaporation, and the usual monthly and annual meteorological summaries.

Monthly Weather Review, [January-February 1933] (*U.S. Mo. Weather Rev., 61 (1933), Nos. 1, pp. 32, pls. 11, figs. 10; 2, pp. 33-59, pls. 9, figs. 6*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 1.—Solar Activity and Radio Reception, by H. T. Stetson (pp. 1-3); The Magnitude of the Error in Measurements of the Solar Radiation Received on a Horizontal Surface Arising from the Assumption that the Ratio between Radiant Energy Received and Electrical Energy Recorded is a Constant, by H. H. Kimball and I. F. Hand (p. 4); Certain Flood-Flow Phenomena of Iowa Rivers, by F. A. Nagler (pp. 5-7); The Technical Use that Engineers Make of United States Weather Bureau Observations, by C. H. Lee (pp. 7-10); Florida Hurricanes, by R. W. Gray (pp. 11-13); Lake Okeechobee and Safety from Tropical Storms, by A. J. Mitchell (pp. 13-15); The Relative Distribution of Early and Late Seasonal Rainfall in Southern California, by C. C. Conroy (pp. 15, 16); Severe Sand Storm in Eastern Wyoming, January 18, 1933, by F. L. Disterdick (pp. 16, 17); Unusual Lunar Halos (p. 17); The Dust Storm of January 22, 1933, over Sections of Illinois, Indiana, and Michigan, by C. G. Andrus (p. 17); and Solar Halo, December 14, 1932, at Moorhead, Minn. (p. 17).

No. 2.—Some Additional Facts about the Climate of Death Valley, Calif., by E. E. Eklund (pp. 33-35); Tides and Coastal Currents Developed by Tropical Cyclones, by I. M. Cline (pp. 36-38); A Brief Study of Oregon Temperatures, by E. L. Wells (pp. 38-40) (see p. 333); The Summer Nighttime Clouds of the Santa Clara Valley, Calif., by E. H. Bowie (pp. 40, 41); Some Aspects of Free-air Winds in the Far West, by T. R. Reed (pp. 42, 43); The Relation of June Temperature to the Maturing of Corn in Iowa, by C. D. Reed (pp. 43, 44) (see p. 333); Raininess Charts of the United States, by E. R. Miller (pp. 44, 45) (see below); Organization of the Meteorological and Aerological Services Relative to Aviation in Chile, by J. B. Navarrete (pp. 45, 46); and Aeronautical Meteorology in Germany, by E. R. Miller (p. 46).

Meteorological observations, [March-April 1933], C. I. GUNNESS and H. JENKINS (*Massachusetts Sta. Met. Ser. Buls. 531-532 (1933), pp. 4 each*).—The usual summaries are given of observations at Amherst, Mass., with brief notes on the more significant features of the weather of each month.

Raininess charts of the United States, E. R. MILLER (*U.S. Mo. Weather Rev., 61 (1933), No. 2, pp. 44, 45, figs. 5*).—The average raininess (number of days on which 0.0 in. or more of rain or melted snow falls) of the United States for the four seasons and for the year is shown in five charts. These show that "the number of rainy days is relatively greater in the Northeastern States than in the Southern. Hence the gradient of raininess from the Gulf States to the Lake region is somewhat steeper than the gradient of rainfall. The annual march of raininess varies from the interior toward the oceans. In the interior the raininess is smallest in winter, but is then largest on the Pacific slope. The North Atlantic States have relatively uniform raininess

throughout the year, but in the Gulf States winter and spring exceed summer and autumn." It is noted that raininess is more uniformly distributed than rainfall.

The relation of June temperature to the maturing of corn in Iowa, C. D. REED (*U.S. Mo. Weather Rev.*, 61 (1933), No. 2, pp. 43, 44).—Data are briefly presented to show that "the extent of autumn frost damage in Iowa is largely determined by the mean temperature of the previous June. . . . All of the outstanding years of frost damage had a June mean temperature below 67°."

A brief study of Oregon temperatures, E. L. WELLS (*U.S. Mo. Weather Rev.*, 61 (1933), No. 2, pp. 38-40).—It is stated that, considering only places where reliable records have been kept, the normal annual temperature of Oregon ranges from about 56° F. in the lower Snake River Canyon, in the extreme northeast, to about 38° in the high Cascade Mountains. The range in normal minimum temperatures for January is from 12° to 40°. Attention is called to the important part that latitude, altitude, nearness to the ocean, and local topography play in control of temperature in the State, and it is pointed out that high summer temperatures in the interior are often attended by low temperatures on the coast.

"It is difficult to determine the length of the growing season in the colder parts of Oregon, for over those regions agriculture is mostly confined to the growing of the hardier crops; moreover, in regions where the nights are so uniformly cool even the less hardy crops seem to develop a degree of resistance to frost. The records of killing frost show that over most of the region west of the Cascades the length of the growing season is more than 150 days, reaching 250 days on the coast. In the principal agricultural districts east of the Cascades it is between 100 and 200 days. Some of the high plateau districts have less than 50 days, and there are regions where frost may occur in any month of the year. However, even in these regions considerable areas are devoted to agriculture, and even some potatoes and garden vegetables are grown."

It is stated that "there is very little in the records . . . to indicate a progressive change in temperature."

SOILS—FERTILIZERS

[Soil Survey Reports, 1928 Series] (*U.S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1928, Nos. 28, pp. 46, pls. 3, fig. 1, maps 2; 29, pp. 60, pl. 1, fig. 1, maps 2*).—These two surveys were made with the respective cooperation of the New York Cornell and California Experiment Stations.

No. 28. Soil survey of Suffolk and Nassau Counties, New York, C. Lounsbury et al.—Suffolk and Nassau Counties cover nearly seven eighths of Long Island, possessing a combined area of 1,194 sq. miles (about 764,000 acres), the lands included consisting in general of two longitudinal moraines with two outwash plains, the one between two ridges and the other forming a south-shore belt.

The present survey places 22 types in 11 series, including Sassafras loam as amounting to 15.1 percent of the total area examined; Sassafras sandy loam, 12.4 percent; Dukes loamy sand, 12.1 percent; and Haven loam, 10.3 percent; with 4.9 percent of tidal marsh and small areas of 6 miscellaneous materials.

No. 29. Soil survey of the San Luis Obispo area, California, E. J. Carpenter and R. E. Storie.—The San Luis Obispo area occupies 469,760 acres, for the most part included in San Luis Obispo County and a small portion of the southern end of Santa Barbara County. Physiographic features include coastal terraces, parts of the Santa Lucia Mountains, and a foothills region,

The area includes 60.3 percent of rough mountainous lands and 3 percent of rough broken and stony land, coastal beach and dune sand, tidal marsh, and river wash. The agricultural lands are classified as 18 series inclusive of 30 types, of which Arnold sandy loam, covering 5.8 percent of the total area, is the most extensive.

[**Soil Survey Reports, 1930 Series**] (*U.S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1930, Nos. 1, pp. 17, pls. 2, fig. 1, map 1; 2, pp. 24, fig. 1, map 1; 3, pp. 24, fig. 1, map 1*).—The reports here noted deal with surveys made with the cooperation, respectively, of the New Mexico Experiment Station, the Iowa Experiment Station, and the Maryland Geological Survey and the Maryland Experiment Station.

No. 1. *Soil survey of the Fort Sumner area, New Mexico*, A. T. Sweet and E. N. Poulson.—The Fort Sumner area comprises 79,360 acres, forming a part of De Baca County in east-central New Mexico, and in surface relief presenting the features of a nearly smooth plain with drainage through the Pecos River.

The 14 soil types identified are classified as 3 series. Springer fine sandy loam, with the inclusion of a rolling phase, occupies 51.5 percent of the total area surveyed, and Springer loamy fine sand covers a further 15 percent. The unclassified material was found to consist of 1.5 percent of river wash. Alkali and pH determinations are included.

No. 2. *Soil survey of Calhoun County, Iowa*, W. E. Tharp et al.—Calhoun County, northwestern Iowa, possesses an area of 363,520 acres, of which the surface relief is that of an uneven plain having a combination of artificial and natural drainage adequate throughout the area of the county.

The survey reveals 18 types in 12 series. The most extensive type listed is Webster silty clay loam, found to cover a total of 39.1 percent of the area of the county, with 34.7 percent of Clarion loam and 18 percent of Webster loam. The only unclassified material found was 1.2 percent of muck.

No. 3. *Soil survey of Kent County, Maryland*, H. B. Winant and J. P. Bewley.—Kent County, northeastern Maryland, is an area of 180,480 acres, flat to rolling in surface, and draining to the Sassafras and Chester Rivers and Chesapeake Bay.

Of the 4 series and 12 types identified Sassafras silt loam was found to occupy 43.8 percent of the total area surveyed, with 16.6 percent of Keyport silt loam and 8.2 percent of unclassified coastal beach, meadow, and tidal marsh.

The genesis and development of two profiles of a drift soil in the north-east of Scotland, A. B. STEWART (*Jour. Agr. Sci. [England]*, 23 (1933), No. 1, pp. 73-96, figs. 2).—Of the two soil profiles upon which report is made in the present paper, one was in uncultivated land, the other in an adjoining cultivated soil derived from parent material of the same geological origin.

The first of the two soils was found to belong to the class of podsolized soils, but was shown to contain large reserves of unweathered material. Iron was "the only constituent which is present mainly in the 'HCl-soluble' condition." Further, "there is a tendency for certain of the bases, especially lime, to be retained in the surface vegetational layer A₁. There is more evidence of the leaching of Na and Mg than of Ca and K. Some organic material has also been carried down into the lower layers, but leaching generally has not proceeded to any great extent. The H-ion concentration diminishes with depth as in a typical podsol, and the relative proportions and distribution of the replaceable cations Ca, Mg, K, and Na, when these alone are considered, are in agreement with the results generally found in acid soils. . . . The external factors, climate and vegetation, appear to have determined the direction of

weathering—towards a soil of the podsolized type—but the unweathered material in the soil seems to be presenting the rapid formation of a podsol. The soil appears to be ‘young’ in the geological sense.”

Of the cultivated area of the same soil it is recorded, in part, that “cultivation has increased the amount of weathered or easily soluble constituents in the soil and has prevented leaching to a considerable extent. . . . There is less evidence of podsolization than there is in the virgin profile. The organic material is concentrated mainly in the upper layer; there has been little leaching of the cations Ca and K, and only comparatively little leaching of Mg and Na from the surface soil. The soil is less acid than the virgin soil, and, except as compared with the A_i layer in the virgin profile, there is a higher content in replaceable bases in this profile from cultivated land.” The relative proportions and distribution of the replaceable cations Ca, Mg, K, and Na were found to agree with the results generally found in acid soils.

“Assuming that this profile would have been very similar to the virgin profile had it not been cultivated, cultivation may be regarded as having brought about a ‘regradation’ of the profile to a less podsolized type—a type bearing some resemblance to a brown earth.”

Soil formation in southern Nigeria (the “Ilepa” profile), H. C. DOYNE and W. A. WATSON (*Jour. Agr. Sci. [England]*, 23 (1933), No. 2, pp. 208–215).—The typical profile of southwestern Nigeria, formed over acid igneous rocks under alternating conditions of percolation and evaporation, is described, the profile being (1) brown sandy soil, (2) concretion layer, (3) red clay, (4) mottled red and white clay, (5) whitish clay, (6) rotting rock. Acidity was found to increase with depth. Analyses of the concretion layer showed it to consist chiefly of silica (quartz) and ferric oxide, with occasionally some manganese. Alumina did not occur extensively.

On the basis of the mobility of the iron and soluble salts throughout the profile, “it is suggested that the profile is developed by a rise of an iron sol which is deposited on a layer of quartz to form the concretions. The Yoruba name ‘Ilepa’ has been adopted by the authors for describing such a profile.”

Some notes on the soils of the Trans Nzoia, with suggestions for the carrying out of simple field tests for their economic lime requirements, G. H. G. JONES (*Kenya Dept. Agr. Bul.* 8 (1932), pp. 11).—The bulletin gives a condensed description of the light reddish soils of the Trans Nzoia, the statements being based upon about 100 observations of soil profiles, surface observation covering some 10,000 acres, simple tests for plant nutrients, etc. The bulletin takes up such topics as topography, geological origin, and mode of soil formation; the lime status of the Trans Nzoia soils; the meaning of soil pH value; liming as a farm practice in the Trans Nzoia; making the field test; and the phosphate status of the Trans Nzoia soils. An appendix adds a tabulated statement of pH values and estimates of available phosphoric oxide content.

Proceedings of a conference of East African soil chemists held at the Agricultural Research Station, Amani, Tanganyika Territory, May 21st–26th, 1932 (*Tech. Confs. East African Dependencies, Nairobi, 1932*, pp. 25).—The report contains discussions of the soil map of East Africa; of soil classification and nomenclature for East Africa; of analytical methods, including mechanical analysis, organic carbon, exchangeable bases, pH methods, sodium estimation, nitrogen, the thiocyanate test, the separation and analysis of the clay fraction, physical determinations, mineralogical determinations on sand fractions and rocks, and color; of soil problems involved in shifting cultivation; of a deficiency disease (“yellows”) of tea in Nyasaland; and of termites as

agents in soil-forming processes. Of two appendixes the first concerns an exhibit of soil profiles, the second being a memorandum on soil description and sampling for use in East Africa.

The colonization of the Katmai ash, a new and inorganic "soil", R. F. GRIGGS (*Amer. Jour. Bot.*, 20 (1933), No. 2, pp. 92-113, figs. 5).—Further detail is added to the observations already reported upon (E.S.R., 68, p. 738) with respect to the appearance of certain liverworts as vegetative pioneers on volcanic ash ejected by the Katmai volcano in 1912, the ash being devoid of organic matter and practically nitrogen free (nitrates none, total nitrogen from 15 to 42.6 p.p.m.) when covered by a vigorous growth of the liverworts in 1930. The two more important species identified were the minute forms *Lophozia bicrenata* and *Cephaloziella byssacea*. The last named appeared the more abundant form.

The paper discusses the results of the earlier Katmai expeditions; revegetation of other volcanic areas; liverworts as the pioneers on pure ash; physical and chemical conditions of the liverwort habitat; algae as indicators of available nitrogen; contaminations of the liverwort layer; possibility of symbiotic relations; liverworts unable to draw nourishment from a distance; liverworts on substrata other than the ash; and relations of the liverworts to succeeding plants.

A study of the exchangeable bases of some East Anglian soils derived from the Jurassic and Cretaceous sediments, with special reference to their marine origin, M. L. M. SALGADO (*Jour. Agr. Sci. [England]*, 23 (1933), No 1, pp. 18-30).—The results of an investigation of the exchangeable bases of some East Anglian soils derived from the Oxford, Amptill, Kimeridge, and Gault formations of the Jurassic and Cretaceous ages are recorded. "As they were formed under the sea the original sediments contained sodium-clays, but on the return of terrestrial and fresh-water conditions the character of the deposits was completely changed and they now contain only traces of exchangeable sodium."

In the unweathered clay, represented by the 18 to 42 in. layer, exchangeable calcium formed only 75 percent of the total, magnesium 20 percent. As a result of leaching and weathering the magnesium on the surface is replaced by calcium which in the top 18 in. forms 85 percent, with the magnesium only 10 percent. "Thus the surface and deeper soils are distinguished by characteristic calcium:magnesium ratios." The ratio of divalent:monovalent bases was the same in the weathered top 18 in. and the lower layers. Samples of Oxford and Kimeridge clays obtained from deep brick pits showed in some cases quantities of exchangeable sodium larger than those of the surface layers, but there was still not enough to characterize them as sodium clays.

"The results prove that the poor tilth and difficulty in working Oxford, Gault, and similar soils is not due to the presence of sodium clays, . . . but is merely a natural result of the large amounts of clay and fine silt present in these soils."

Cohesion and viscosity of clays, E. G. RICHARDSON (*Jour. Agr. Sci. [England]*, 23 (1933), No 2, pp. 176-184, figs. 5).—The author describes the principles and operation of a hot-wire viscosimeter constructed on the concentric cylinder principle and adapted to the direct measurement of velocity gradients; a second type of concentric cylinder apparatus in which the inner cylinder was suspended by a wire from a torsion head, of which the purpose was "to obtain measurements of the more conventional type connecting the velocity of the outer cylinder with the torque exerted on the inner"; and some measurements of the properties of clay pastes obtained by the use of these devices.

He distinguishes "four types of liquid, classifying them according to their behavior under stress: (1) Normal liquids. Torque/rate of shear=constant. (2) Suspensions, including emulsions. Torque/rate of shear continually diminishing as the latter is increased. (3) Pastes. Flow in three stages as stress is increased: (a) Rigid resistance, (b) quasi-solid friction, (c) suspension flow. . . . (4) Gels. Elastic resistance to small stresses; behavior to large stresses the same as (3)."

The significance of certain "single value" soil constants, E. W. RUSSELL (*Jour. Agr. Sci. [England]*, 23 (1933), No. 2, pp. 261-310).—As a result of a detailed statistical analysis of the physical property, data available from certain Natal soils which were studied, the base exchange capacity of the soil, as measured by the Schofield potassium phosphate buffer method, appeared of predominant importance for predicting several of such soil properties, as, for example, the sticky point and the moisture content at 50 percent relative humidity; whereas the clay content, on the other hand, seemed to be of minor importance in predicting these soil properties. Further, "the information from the data supplied by the Keen-Raczkowski box indicates that w , the weight of water held per gram of soil in the box, is very closely correlated with the base exchange capacity of the soil, while the swelling and pore-space parameters are more complex. The swelling v seems to be dependent on the base exchange capacity of the soil and a term probably representing the structure of the soil, while the pore space p seems to be dependent on the clay content and a soil structure term. By choosing an appropriate definition of the pore space, practically all the structure information given by the swelling parameters is contained in it.

"The xylene equivalent measures a property of the soil that is independent of the organic matter present, and can be almost completely predicted from parameters determined on the soil after it has been boiled with hydrogen peroxide. It is more completely determined than any other variate by the amount of clay and silt in the soil, though this prediction is not strikingly good. The moisture equivalent can be predicted with great accuracy from the xylene equivalent and the base exchange capacity of the soil. The amount of imbibitional water in the soil, as determined from the moisture equivalent and the xylene equivalent, is of only limited value as a prediction variate. The two primary variates are always considerably better. It is fairly closely related to the base exchange capacity of the soil, but the whole theory underlying its determination is so doubtful that it is impossible to give any exact meaning to the quantity so determined."

Finally, "it appears that if the box parameters and the xylene equivalent were given for the Natal soils, none of the other parameters would add very much extra information. The loss on ignition has not been studied in very great detail because an extensive preliminary examination of its properties, and particularly of the ignition losses of the natural and the peroxide-treated soils, gave results of no great importance."

The buffer capacity of peat soils, B. D. WILSON and M. J. PLICE (*New York Cornell Sta. Mem.* 146 (1933), pp. 11, figs. 2).—The buffer capacity of the soils investigated was found closely related to the initial soil reaction and base content of the soils, low acidity and a high content of bases being associated with a high buffer capacity with respect to hydrochloric acid. With respect to sodium hydroxide the order is reversed. Numerical expressions for buffer capacity, based on the milliequivalents of H ions inactivated by the soils, show a high coefficient of correlation between buffer capacity and the initial reaction of the soils. An intimate relationship between the buffer capacity

of the soils and the amount of ash and the amount of calcium which the soils contain was also demonstrated.

Removal of the exchangeable cations from the soils by means of electrodialysis reduced the buffer capacity of the soils with respect to hydrochloric acid and increased it with respect to sodium hydroxide. The organic matter of the electrodialyzed soils had little or no effect in buffering the soils against hydrochloric acid. "Undoubtedly the organic matter, of which the soils are largely composed, plays an important part in buffer action because of its capacity as an absorbing medium of cationic material. Electrodialysis increased the buffer capacity of the soils toward sodium hydroxide by increasing the soil acidity. Some of the buffer effect toward the alkali appears to be due directly to the organic matter of the soils. The results of the experiments indicate that soil reaction is a reliable index of the buffer capacity of the peat soils used in the investigation."

Oxygen absorption in soils, F. B. SMITH and P. E. BROWN (*Iowa State Col. Jour. Sci.*, 7 (1933), No. 2, pp. 153-161, pl. 1, figs. 5).—The authors of this contribution from the Iowa Experiment Station found that the results secured with the manometers do not represent oxygen absorption alone but are a resultant of several processes, of which the simplest might be oxygen absorption together with the evolution of "some noncombustible gas, insoluble in potassium hydroxide."

It was further observed that "the pressure produced in the flasks was not produced entirely by a difference in temperature either outside or inside the flask. No combustible gases (hydrogen or methane) were found. The pressure was produced at low moisture content of soil and at high concentration of oxygen. The nitrate content of the soil was low, and it seems unlikely that nitrogen gas was evolved through denitrification. It is possible, but seems unlikely, that under rapid oxidation, such as would take place with dextrose in soil in an atmosphere of oxygen, higher temperatures were reached in the experiments where a pressure was produced than were measured by the Beckman thermometer."

The rate of decay in relation to soil types and vegetative covering in Glamorgan, W. E. ISAAC (*Jour. Agr. Sci. [England]*, 23 (1933), No. 1, pp. 31-72, figs. 2).—The author investigated certain Glamorganshire soils to determine the extent to which the decomposing power of soils within a climatic region is influenced by the geological character of the rocks from which the soils are derived, and by the nature of the vegetative covering. The soils of south Glamorgan appeared in general to be Brown Earth types.

A suitable form of organic matter for the study of the decomposing power of a soil was found in crushed linseed. An apparatus found better adapted for the measurement of carbon dioxide evolution than those previously reported upon is described in detail, as are also the methods used for maintaining standard conditions of temperature, humidity, and water content of incubated soil, and for estimating the carbon dioxide evolved from the soil.

"The differences in decomposing power, although not great, are quite distinct, and in general seem to run parallel with the fertility of the soils. . . . Soils seem to show a very marked seasonal periodicity in decomposing power. . . . The seasonal differences in the decomposing power of a single soil exceed the differences between the decomposing power of different soils. The modifying effect of different types of vegetation on soils derived from the same parent rock may be slight (lower Lias) or considerable (Devonian Red Marl).

"The Glamorganshire soils examined can be arranged in the following order of increasing power of decomposition: Devonian heath and Pennant grit;

carboniferous limestone; Triassic Breccia B, Devonian woodland, and lower Lias woodland; lower Lias semiscrubland; marine alluvium; Triassic Limestone Breccia A. The differences between the respiratory power and decomposing power of a single soil are very marked and far exceed the order of the differences between the decomposing power of different soils. The differences between the respiratory power of different soils are more marked than the differences in decomposing power. A 10-day experimental period would seem the best for studying the comparative power of soils in decomposing crushed linseed."

The decomposition of certain types of forest litter under field conditions, J. G. FALCONER, J. W. WRIGHT, and H. W. BEALL (*Amer. Jour. Bot.*, 20 (1933), No. 3, pp. 196-203).—This joint contribution from the New Jersey College of Agriculture and the Dominion Forest Service of Canada reports a study of the loss by weight of stems of bracken and the litter on the forest floor in a white pine stand during the field season of 1929 and of forest litter in stands of red and jack pine in 1930.

Under like conditions of temperature and precipitation, (1) the litter in a white pine forest was found to decompose more rapidly than the litter composed of the stems of the common bracken. (2) The litter of both red and white pine was found to decompose more rapidly than the litter of jack pine. (3) The twigs of white pine were found to decompose more than twice as rapidly as those of red pine and over 4 times as rapidly as those of jack pine. (4) The twigs of red pine were found to decompose more than 1.7 times as rapidly as those of jack pine.

The loss in percentage by weight for all materials studied was found to increase with an increase in temperature and precipitation. "Thus, a mean temperature of 63.65° F., when accompanied by a total precipitation of 14.82 in., was found to be more favorable to the decomposition of the combined F and H layers in a white pine forest and the stems of the common bracken than a mean temperature of 59.85°, when accompanied by a precipitation of only 5.72 in."

The effect of a soil mulch on soil temperature, E. S. WEST (*Jour. Council Sci. and Indus. Res. [Aust.]*, 5 (1932), No. 4, pp. 236-246, figs. 8).—The layer of soil at the surface loosened by cultivation has a lower heat diffusivity than the compact soil. In the case investigated, the heat diffusivity was reduced to 0.17 of that of the original compact soil. This resulted in the soil temperature wave of cultivated soil being markedly damped as compared with that of the uncultivated soil for any specific depth below the cultivated layer. In the cultivated layer itself, the temperature wave at the surface had a greater amplitude than the temperature wave at the surface of undisturbed soil, but at the bottom of the cultivated layer the amplitude was much less in the cultivated soil than at a similar depth in the uncultivated soil. The mean temperature during the summer months, down to a depth of 60 cm, was about 2° C. lower in the cultivated soil than in the undisturbed soil.

[Astor Substation soil work] (*Oregon Sta., John Jacob Astor Branch Sta. Pamphlet*, 1933], pp. 2, 3, 5, 6, fig. 1).—The report contains very brief notes on current and completed work under the headings of lime, superphosphate, manure, drainage, and phosphates.

Use of the exponential yield curve in fertilizer experiments, W. J. SPILLMAN (*U.S. Dept. Agr., Tech. Bul.* 348 (1933), pp. 67, figs. 11).—The author discusses a graphic method, a logarithmic method, and a new method which makes possible the determination of the most probable value of the constants by the method of least squares. The application of the exponential yield curve to a specific case in which each of the three common plant-food elements is varied,

including the method of passing from the 1-variable form to the general form of the equation, is shown; a method for determining the quantity, if any, of each of the three common plant-food elements absorbed by the soil and held in a condition unavailable to the growing crop is presented; the form of the yield curve is discussed with a presentation of reasons given for preferring the exponential to the parabolic form; and the derivation of all the commonly employed forms of the exponential yield curve is presented. Also, formulas for determining for specific cases the optimum fertilizer formula to use, the optimum quantity of fertilizer to apply for greatest profit per acre, and for determining the optimum formula to use and the optimum acreage to which to apply a fixed quantity (value) of fertilizer for greater profit per dollar invested in fertilizer, in both presence and absence of the phenomenon of plant-food occlusion by the soil are worked out; plans for obtaining from a relatively small number of experimental plats the data necessary for determining the constants in the exponential yield equation are outlined; and the manner of utilizing check plats as a means of eliminating, insofar as this can be done, unevenness in the yielding power of the soil of the experimental field, is discussed.

On the adsorption of various ammonium compounds in the soil [trans. title], K. NEHRING and A. KELLER (*Kolloid Beihefte*, 37 (1933), No. 7-9, pp. 293-323, figs. 4).—Adsorption experiments were made upon soils of various reactions and treated with several different proportions of calcium and of sodium carbonates, with a view to determining the extent of the fixation of the ammonium radical from a number of ammonium salts.

The ammonium fixation more or less closely paralleled the adsorption capacity. The adsorption was in generally good agreement with the Freundlich adsorption isotherm theory. The effect of the accompanying anions, which was quite distinct, followed, in order of increasing effect, the lyotropic series (Cl , NO_3), SO_4 , $(\text{CO}_2)_2$, PO_4 . When the H ion of the base exchange complex of acid soils was replaced by calcium the adsorption capacity of the soil for the ammonium ion as supplied by ammonium sulfate, chloride, or nitrate was distinctly increased, an effect which was even more marked when sodium entered the exchange complex. The effects of the sodium and calcium ions are referred to the greater exchange mobility of sodium and calcium as compared with that of the H ion.

The take-up of ammonium from its phosphate and oxalate, very marked in acid soils, was noticeably lessened by increasing additions of calcium carbonate. It is considered that the calcium oxalate and phosphate formed, and more especially the calcium carbonate, which, in the cases of the larger additions, passed only partly into the state of adsorptively bound calcium, were able to enter to a certain extent into exchange reactions with the ammonium zeolite first formed. Even in the cases of ammonium salts other than the oxalate and phosphate, the tendency of the larger additions of calcium carbonate to lessen ammonium adsorption was evident. The anion effect was most marked in the cases of soils of acid reaction, being decidedly less in neutral soils. The adsorption capacity of acid soils was found to depend upon the concentration more than did that of the neutral soils.

The effect of ammonium sulphite on plant growth, A. H. LEWIS and F. B. MARMOY (*Jour. Agr. Sci. [England]*, 23 (1933), No. 1, pp. 1-5).—A review of the few recorded investigations into the effects of sulfites in the soil upon plant growth showing conflicting evidence, the authors carried out pot culture experiments to ascertain the effects on the germination, growth, and yield of mustard and rye on a heavy soil of the addition to the ammonium sulfate used as source of nitrogen of varying amounts of ammonium sulfite. Under the conditions

of the experiment, ammonium sulfite had no adverse effect on the germination, growth, and yield of dry matter either of mustard or of rye.

The value of lime on Toxaway loam and Porter's loam soils, C. B. WILLIAMS, W. H. RANKIN, and S. C. CLAPP (*North Carolina Sta. Bul.* 285 (1933), pp. 15).—Field experiments at the Mountain Substation from 1911 through 1931 indicated that for a corn, wheat, red clover rotation, the soils in question were in need both of limestone and of complete fertilizer, limestone with superphosphate alone failing to give as satisfactory a result. When the rotation consisted of potatoes, wheat, and clover, however, limestone had a bad effect on both the yield and the quality of the potatoes.

Memorandum on the lime resources of Kenya Colony, with special reference to future requirements and economy of transportation, G. H. G. JONES (*Kenya Dept. Agr. Bul.* 12 (1932), pp. 15, pl. 1).—The bulletin presents a brief account of the local situation under the headings of future requirements of limestone; sources of lime; the future annual lime requirements, under which is included brief specific consideration of such crops as coffee and tea, maize, other cereals, and sisal; the needs of different parts of the colony; special note on local supplies of lime within the Trans Nzoia; the estimation of the manurial value of phosphatic limestone deposits; and natural reserves of phosphates within the colony. Several appendixes, of which the last takes the form of a map, summarize certain details of the information collected.

AGRICULTURAL BOTANY

A textbook of botany, I-III, J. M. COULTER, C. R. BARNES, and H. C. COWLES (*New York: Amer. Book Co., rev. and enl., 1930, vols. 1, pp. VIII+310, figs. 618; 2, pp. VIII+307, figs. 87; 1931, vol. 3, pp. X+499, figs. 541*).—This is a revision of the work previously noted (*E.S.R.*, 27, p. 328). Volume 1, morphology, has been revised by Coulter; volume 2, physiology, by C. A. Shull; and volume 3, ecology, by G. D. Fuller.

A textbook of plant physiology, N. A. MAXIMOV, trans. edited by A. E. MURNEEK and R. B. HARVEY (*New York and London: McGraw-Hill Book Co., 1930, pp. XVI+381, pl. 1, figs. 152*).—This book, translated from the Russian, is claimed in an editorial note to present the fundamentals of the physiology of plants, giving examples of phases applicable in agriculture and forestry, including the important features of plant physiology that a beginning student should acquire. It is arranged in three major parts having chapters to fit it for class work. The American literature of the subject is included as source material. Russian literature is made more freely available than formerly. It is pointed out that Russia offers a wide range of ecological conditions, including frost injury and drought effects.

Julius Sachs, founder of the new plant physiology, 1832-1897, E. G. PRINGSHEIM (*Julius Sachs, der Begründer der Neueren Pflanzenphysiologie, 1832-1897. Jena: Gustav Fischer, 1932, pp. XII+302, pls. 13*).—This memorial to Julius Sachs appears in honor of his one hundredth birthday.

Regenerative organ formation in roots, H. TWELE (*Untersuchungen über Regenerative Organbildung an Wurzeln. Diss., Hamburg Univ., 1929, pp. III+33, fig. 1*).—This is a University of Hamburg thesis.

Effect of sulphur compounds in breaking the dormancy of potato tubers and in inducing changes in the enzyme activities of the treated tubers, L. P. MILLER (*Contrib. Boyce Thompson Inst., 5 (1933), No 1, pp. 29-81, figs. 11*).—Further studies confirmed results previously noted (*E. S. R.*, 68, p. 757). Compounds found effective included ammonium dithiocarbamate, thiosemicarbazide, ethyl mercaptan, hydrogen sulfide, thioacetamide, thioglycol, methyl

disulfide, and various derivatives of dithiocarbamic acid. Thioacetamide differed from the other chemicals studied in that it retards the germination of nondormant tubers besides breaking the dormancy of dormant tubers. The probable reason for these effects is discussed.

The juices from potatoes treated with certain of these chemicals were examined as to pH, iodine absorption, catalase, and peroxidase activity, and reducing sugar and sucrose content at intervals after treatment, and compared with juices from corresponding check potatoes. In general, the treatments resulted in increases in the activity of the enzymes studied, although the extent of the increases was not a measure of the efficacy of the treatments. Large increases in sucrose resulted from the treatments, even in completely nondormant tubers which already had a relatively high sucrose content. The changes in the properties of the juices of treated potatoes in general agree with those found previously for treatments with thiourea and sodium thiocyanate.

In the case of vapor treatments of whole tubers, large increases in the respiratory activity resulted, while such large increases did not occur after treatment of cut pieces. The increases in enzyme activity found in the case of the treatments evidently were due to a tissue response of the treatments and not to any direct effect on the enzymes. The chemicals added directly to the juices had a very marked effect in retarding the darkening which normally occurs when potato juice is exposed to the air. This was manifest even in very dilute concentrations of chemicals.

Normal growth of potato leaves in greenhouse and field, W. E. STONE (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 6, pp. 565-578, figs. 9).—A record of the growth of normal potato leaves in greenhouse and field during the early part of the summer, when optimum conditions for plant growth prevail, was made at the Vermont Experiment Station to ascertain the period of maximum surface expansion under normal conditions during both day and night. See also an earlier note (E.S.R., 68, p. 311). All leaves on a single potato shoot on plants of the Green Mountain variety were measured at intervals for a period of about 20 days in the greenhouse during May and in the field in July.

The growth of leaflets and leaves followed the typical S-shaped curve. The leaves first formed ceased growing during the early part of the observations, and the next younger leaves then began rapid growth. When the observations terminated the youngest leaves were just beginning this period of accelerated growth. The growth rate of leaflets composing a single leaf was not always the same on any single day. The growth of a shoot continued after the flower clusters were formed, a new vegetative shoot pushing them to one side. In this manner, the shoot continues to grow and the foliage to increase in spread. Measurements on rapidly growing leaflets showed the night growth in greenhouse plants to be 54.1 percent and the day growth 45.9 percent, and the night growth in outdoor plants to be 56.8 percent and the day growth 43.2 percent. The accelerated growth of each leaf seemed to be checked by the development of a newer leaf. The checking of vegetative growth in the potato plant, however, did not seem due to flower formation, for growth continues after flower clusters have appeared.

The upward movement of inorganic solutes in plants, H. F. Clements (*Wash. State Col., Res. Studies*, 2 (1930), No. 3, pp. 91-106, figs. 5).—Chemical and anatomical studies regarding translocation activities in *Vitis vinifera*, *Rubus occidentalis*, *R. idaeus strigosus*, *R. neglectus*, *Pyrus malus*, *Prunus americana*, and *P. persica* show a continuation after girdling of the upward movement of the ash constituents and nitrates in stems of grape, raspberry, and plum. It is thought that the distribution of tracheae in the seasonal development of xylem constitutes to a large degree the factor which determines

the ease with which plants tolerate girdling. Ash solutes apparently are carried by the xylem stream. Views of others are critically discussed.

Transpiration in plants, I, II [trans. title], A. SEYBOLD (In *Ergebnisse der Biologie*. Berlin: Julius Springer, 1929, vol. 5, pp. 29-165, figs. 38; 1930, vol. 6, pp. 559-731, figs. 40).—The first of these communications deals with the physics of transpiration, the energy involved, the methods of its measurement, the contributory factors, and the transpiration system and the physical components of transpiration; the second with the physiology and the ecology of transpiration.

The effect of the 1932 eclipse upon the width of stomatal openings in gray birch, J. L. DEEN and M. H. BRUNER (*Ecology*, 14 (1933), No. 1, pp. 76, 77, fig. 1).—A graphic representation of microscopic measurements made at 15-minute intervals of the width of the stomatal openings in gray birch leaves during August 31, the day of the eclipse, and during subsequent days showed an influence of the abnormal light conditions prevailing during the eclipse.

Respiration of cranberry plants in relation to water injury, H. F. BERGMAN (*Amer. Cranberry Growers' Assoc. Proc. Ann. Meeting*, 60 (1930), pp. 21-25).—Following measurements of respiratory activity in various parts (buds, blossoms, fruits, and leaves) of the cranberry plant, it is stated that the injury to vines resulting from flooding was due almost entirely to lack of oxygen (asphyxiation) and not notably to any chemically injurious substance in the water. Factors in this outcome are activity of the vines at submergence; temperature of the water; weather conditions, particularly clear or cloudy sky; and source of water supply. Buds, small fruits, and growing tips are most apt to be injured since they respond most rapidly and require the most oxygen.

Some carbohydrate changes in shelled green peas, Z. I. KERTESZ (*New York State Sta. Bul.* 622 (1933), pp. 14, fig. 1).—Asserting that the supposition that sugars are transformed into starch in shelled green peas is without foundation and has probably arisen from the fact that starch remains practically unchanged while other constituents are lost in respiration, the author emphasizes the fact that the methods of sampling and calculation are mostly responsible for the few data in the literature which seem to bear out this supposition. In the experiments reported no evidence was found of any transformation of sugar into starch during storage. Some increase was noted in other acid hydrolyzable higher carbohydrates and in the fraction insoluble in 80 percent hot alcohol, but because of fluctuations observed no definite deductions could be drawn.

Botanical-serological studies, B. K. BOOM (*Botanisch-serologische Onderzoekingen. Proefschr., Landb. Hoogeschool, Wageningen*, 1930, pp. [10]+77).—This doctor's thesis contains references to related work by about 100 authors.

The influence of ultraviolet rays on the life relations of soil bacteria [trans. title], A. SCHEITZ (*Arch. Mikrobiol.*, 1 (1930), No. 4, pp. 577-598, figs. 5).—The chemically active rays from the Vitalux lamp affect unfavorably the numbers of living aerobic soil bacteria, this effect being modified by the thickness of the soil layer and the duration of the exposure. In case of thin layers, most of the bacteria die during the first hour; afterwards progressively fewer remain alive. Sunshine has a similar effect, though no laws were determined.

Mycorrhiza in relation to tree growth, M. C. RAYNER (*Empire Forestry Jour.* [London], 9 (1930), No. 2, pp. 182-189).—"In the case of young conifer plantations, for example, it has been observed that poor growth and a condition of check is marked by absence of mycorrhiza, and that emergence from this unsatisfactory condition is correlated with its free development. It remains for careful research to demonstrate a causal relation between the two phenomena."

GENETICS

Evolution, genetics, and eugenics, H. H. NEWMAN (*Chicago: Univ. Chicago Press, 1932, 3. ed., pp. XXIV+620, figs. 100*).—This is a revision of the book previously noted (E.S.R., 55, p. 223). The first two parts are devoted to a historical account of the development of the theory of organic evolution and the evidences for it. The third and fourth parts have been largely rewritten and deal with genetic principles as applied to plant and animal breeding and eugenics, emphasizing these as the mechanism of evolution.

Recent revivals of Darwinism, H. F. OSBORN (*Science, 77 (1933), No. 1991, pp. 199-202*).—After briefly referring to the tendency of J. B. S. Haldane, J. S. Huxley, and T. H. Morgan to revert to the ideas of more or less pure Darwinism as regards evolution, the author refers to the historic explanations of the modes and causes of evolution as set forth by Lamarck, Geoffroy St. Hilaire, and Aristotle. Following this he expresses the view that the underlying causes of evolution are entirely unknown and may prove to be unknowable.

Inheritance in barley, D. W. ROBERTSON (*Genetics, 18 (1933), No. 2, pp. 148-158*).—Further genetic studies with barley (E.S.R., 67, p. 375; 69, p. 29) at the Colorado Experiment Station dealt with the inheritance of simple Mendelian factor pairs and their possible linkage relations. The inheritance of the character pairs intermedium v. nonintermedium, *Ii*, green v. white seedlings in Black Hull-less, *A_ba_b*, and purple v. white straw color, *Pr pr*, was explained on a simple Mendelian basis. The factor pair, *F_cf_c*, for green v. chlorina seedlings was found to be inherited independently of *Nn* of group III, *Kk* of group IV, and *Ss* of group V. It was previously found to be inherited independently of factors in group I, II, and VI. *Ii* was found to be linked with *Kk* with 15.12 ± 0.065 percent crossing-over, while *Vv* was found to be inherited independently of *Kk*, indicating that *Vv* and *Ii* are not in the same linkage group. *A_ba_b* was found to be inherited independently of *Kk* and *Nn*, but was linked with *Ss* with a percentage cross-over of about 26. *Pr pr* was found to be linked with *Vv* with a cross-over value of 9 ± 0.68 , but inherited independently of *Ii*.

The present study added another linkage group to the six already found. *F_cf_c* was found to be inherited independently of at least one factor pair in each of the already known groups. *Ii* was added to group IV, *A_ba_b* to group V, and *Pr pr* to group I.

Inheritance of an anomaly in corn [trans. title], M. BONVICINI (*Italia Agr., 69 (1932), No. 8, pp. 716-722, figs. 11*).—Unusual development of the palea in certain strains of corn persisted from year to year, being expressed most in dry years when it even occurred in varieties not showing it before. The tendency seemed to be inherited in certain varieties, although affected by drought.

The genetics of Gossypium, S. C. HARLAND (In *Bibliographia Genetica. 's Gravenhage (The Hague): Martinus Nijhoff, 1932, vol. 9, pp. 107-182*).—This review of genetic investigations with cotton discusses observations reported from research concerned with the taxonomy, classification, species, and cytology of *Gossypium*; the inheritance of plant, leaf, flower, boll, lint, seed, and physiological characters; and correlations of genetic significance between characters; and includes a list of genes with indicated linkage relations. The bibliography embraces 76 titles.

Natural crossing in cotton, M. A. FIKRY (*Roy. Agr. Soc. Egypt, Tech. Sect. Bul. 18 (1931), pp. 23, pls. 3*).—The average cumulative percentage of natural crossing between Maarad and Red Leaf Acala cotton was found to be 4 percent.

A gradient of pollen starting from the pollen source and falling to zero as it ran away from the source of foreign pollen on both sides was established. The maximum range of pollen transmitted was about 40 m.

Fluorescence of *Lolium* seedlings in ultra-violet light, P. A. LINEHAN and S. P. MERCER (*Nature [London]*, 131 (1933), No. 3302, pp. 202, 203).—Selfing, hybridization, and back-cross experiments with *L. perenne* and *L. multiflorum*, made to ascertain the mode of inheritance of factors responsible for the ultra-violet light fluorescence reaction, produced data confirming original expectations. The capacity to fluoresce appeared to be heritable. *L. perenne* normally is pure for nonfluorescence and *L. multiflorum* for fluorescence. Fluorescence is dominant in the F_1 of pure fluorescent \times pure nonfluorescent, the F_2 giving a ratio not significantly different from 3 fluorescent to 1 nonfluorescent. The back-cross $F_1 \times$ pure fluorescent gave all fluorescent progeny, and the back-cross $F_1 \times$ pure nonfluorescent gave a ratio of about 1 to 1. No genetic linkage was found between fluorescence and the possession of awns on the lower flowering glumes, shoot vernalization, longevity, or vigor. Some of the conclusions agreed with those of Corkill (E.S.R., 68, p. 602), and the content of fluorescence reactors in a given strain seemed to provide a gage of agronomic merit.

Embryo development in *Nicotiana* species hybrids, F. A. MCCRAY (*Genetics*, 18 (1933), No. 2, pp. 95–110, figs. 8).—Eight crosses were made between different species of *Nicotiana*, 2 in each of 4 different groups based on the success of the hybrid. Fertilization, with 3 exceptions, was found to take place on the seventh day. The complete development of the *Nicotiana* embryo from the fertilized egg, described and illustrated, resembles that found in other dicotyledonous angiosperms.

N. rustica \times *N. glauca* and *N. rustica* \times *N. longiflora*, of group 1, completed only one or two cell divisions, did not grow at all, and lived only a day or two. *N. rustica* \times *N. rusbyi* and *N. rustica* \times *N. palmeri*, of group 2, experienced a number of cell divisions so that 16 to 32 cell stages appeared, but failed to make appreciable growth. The embryos of group 3 hybrids, which give a partial germination but die soon after, attained their full size as well as those of group 4. The growth of embryos of hybrids of group 3, *N. nudicaulis* \times *N. tabacum* and *N. suaveolens* \times *N. tabacum*, did not differ essentially from that of embryos of hybrids of group 4. In each case the hybrid embryo curve simulated that of the maternal parent but always fell somewhat below it, even in the most successful crosses, *N. tabacum* \times *N. glauca* and *N. paniculata* \times *N. glauca*. All interspecies crosses are classified in 9 categories, based on the results obtained, ranging from no stimulation in the ovary—complete failure—to the production of fertile or partially fertile hybrids. See also an earlier note (E.S.R., 68, p. 749).

A tri-generic hybrid of *Zea*, *Tripsacum*, and *Euchlaena*, P. C. MANGELSDORF and R. G. REEVES (*Amer. Nat.*, 67 (1933), No. 708, pp. 82, 83).—The hybrid of *Zea* \times *Tripsacum*, according to Texas Experiment Station studies (E.S.R., 67, p. 513), produces a small percentage of functional female gametes, all of which possess the somatic number of chromosomes. This hybrid, when pollinated with *Euchlaena*, exhibits a fertility of about 6 percent, and the triple hybrid resulting from this cross has 38 chromosomes comprising, presumably, 1 genom of 10 from *Zea*, 1 of 18 from *Tripsacum*, and 1 of 10 from *Euchlaena*, apparently combining in 1 plant all the germ plasma of 3 distinct genera. While various characters of each parent are expressed in the hybrid, in general, it resembles *Euchlaena* more than the other 2 parents. Cytological studies at meiosis indicated that there is almost complete pairing of *Zea* and *Euchlaena* chromosomes to form 10 bivalents, while the 18 *Tripsacum* chromosomes behave

as univalents. Little, if any, pairing of *Tripsacum* chromosomes occurs with those of *Zea* and *Euchlaena*.

Studies in the genetics and the cytology of *Ustilago avenae* and *Ustilago levis*. C. S. HOLTON (*Minnesota Sta. Tech. Bul.* 87 (1932), pp. 34, pls. 20).—Genetic and cytological studies revealed two sex groups in *U. avenae*, which causes loose smut of oats, and *U. levis*, responsible for covered smut. Segregation for sex evidently is complete in either the first or the second meiotic division. After mating monosporidial lines of opposite sex, from 35 minutes to several hours was required for fused sporidia to appear in culture. The stages in the fusion process were the production of a projection by one (active) sporidium and the elongation of this projection until it comes into contact with a sexually opposite (passive) sporidium, fusion of the sporidia followed by a decided elongation of the fusion tube, and subsequent production of the infection hypha.

Sporidial fusions in culture and the production of chlamydospores on the host showed that *U. avenae* and *U. levis* hybridize readily. Artificial inoculations with crosses between monosporidial lines of *U. avenae* produced both the loose and covered smuts, while *U. levis* produced only the covered smut. Crosses between *U. avenae* and *U. levis* produced loose, covered, and intergrading types of smut. It seems that both the loose and covered types of smut may be produced on the same variety by the same cross, and that the same cross may produce loose smut on one variety and covered smut on another, whereas the same cross may produce the same type of smut on as many as three different varieties.

Sporidia isolated from germinating hybrid chlamydospores were usually nonculturable. A cross between monosporidial lines from hybrid chlamydospores produced a buff smut, a new and previously undescribed type having hyaline and smooth chlamydospores. The production of this type of oat smut furnished evidence that new physiologic forms of the oat smut fungi may be produced by hybridization between the two species.

Segregation data showed that hybrid chlamydospores are always echinulate, indicating dominance of echinulation over smoothness, and that olive-brown color is dominant over hyalineness. It appears that segregation of factors for cultural characteristics may extend indefinitely beyond the second nuclear division in meiosis. Successively produced sporidia from the same promycelial segment frequently developed distinctly different cultural lines. There was evidence that segregation of factors for cultural characteristics takes place in monosporidial lines. No concrete evidence for mutation in *U. avenae* and *U. levis* was obtained. Cultural variants appearing as sectors in monosporidial lines were interpreted as being the result of segregation.

Cytological studies showed that the sporidia of *U. avenae* and *U. levis*, each promycelial cell and primary sporidium, and the mycelium of monosporidial cultures are all uninucleate. Attempts to stain fusing sporidia were unsuccessful, but according to studies by C. C. Allison fused sporidia initiate the dikaryophase, which is binucleate. This stage persists throughout the parasitic stage to the production of chlamydospores which, when mature, have a single diploid nucleus.

Inheritance in Albit wheat of resistance to bunt, *Tilletia tritici*. E. N. BRESSMAN and L. E. HARRIS (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 4, pp. 361-365, figs. 2).—Further studies at the Oregon Experiment Station (E.S.R., 65, p. 747) gave evidence that Albit wheat contains one main dominant factor (*MM*) for resistance to certain physiologic forms of bunt, the same as carried by its male parent, White Odessa, and found by Briggs (E.S.R., 62, p. 846; 65, p. 345) or by the authors in Martin, White Odessa, Hussar, Banner Berkeley,

and possibly Regal. Albit has morphological characters resembling its female parent, Hybrid 128, and the bunt resistance of White Odessa.

Inheritance of bunt reaction and other characters in Hope wheat crosses, J. A. CLARK, K. S. QUISENBERRY, and L. POWERS (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 5, pp. 413-425, figs. 2).—The parent reaction to bunt and the segregation in F_2 hybrid strains for the wheat crosses Hope \times Marquis, Hope \times Ceres, and Hope \times Hard Federation, were studied cooperatively by the Montana Experiment Station and the U.S. Department of Agriculture.

Hope was found to be strongly resistant, Marquis weakly resistant, Ceres weakly susceptible, and Hard Federation strongly susceptible. Hope \times Hard Federation showed a strong tendency for dominance of susceptibility. In Hope \times Ceres an intermediate inheritance was indicated, but with considerable less than one fourth within the limits of each parent, while in Hope \times Marquis a tendency toward a dominance of the stronger resistance of the Hope parent was noted. Indications were that the stronger the degree of resistance involved in the hybrids the less complex was the inheritance.

Additional studies in the Hope \times Hard Federation populations showed the bunt percentage to be about one fourth the percentage of infected plants. An increase of 5 percent in bunt caused a decrease of about 4 percent in yield. Glume color was shown to be controlled by a single genetic factor and kernel color by at least three factors. The expression of awnedness was rather variable, but two major factors were evident. No important relation was observed between awnedness and bunt or yield.

Chromosome numbers in aneuploid apple seedlings, B. R. NEBEL (*New York State Sta. Tech. Bul.* 209 (1933), pp. 12).—Studies of the chromosome complex of apple seedlings resulting from the crossing of diploids with triploids, triploids with diploids, and triploids with triploids showed all the resulting seedlings to be aneuploid, that is, to possess irregular numbers of chromosomes. An analysis of the data indicated that the basic number of chromosomes in Pomoideae is 7. When the observed numerical values were compared with a calculated normal frequency curve deviations of the observed values occurred where expected in case the number 7 exerts a disturbing influence. Similar comparisons for the number 8 did not meet the facts equally as well.

Since all the aneuploid seedlings obtained had no practical value, the author suggests that the artificial production of polyploid apples must be attacked by other methods.

Chromosome pairing, structural hybridity, and fragments in Rosa, E. W. ERLANSON (*Bot. Gaz.*, 94 (1933), No. 3, pp. 551-566, figs. 23).—Multiple pairing of chromosomes due to reduplication and reciprocal translocation of segments was observed at the University of Michigan in diploid roses belonging to the species complexes *R. multiflora*, *R. blanda*, *R. woodsi*, and *R. pisocarpa*. Although gametes with 8 chromosomes were sometimes observed, no diploid was found with a reduplicated whole chromosomes. Multivalent associations of chromosomes are believed to occur frequently among tetraploid roses but are relatively rare in hexaploids and octoploids. Triploids, probably originating from unreduced gametes without hybridization, were found in diploid cultures of *R. blanda*, *R. macouni*, and *R. pisocarpa*. The exceptional types of pairing found in Rosa are said to be in conformity with the chiasma theory of pairing.

[Papers in animal genetics] (*Amer. Soc. Anim. Prod. Proc.* 1932, pp. 265-291).—The following papers were presented before the genetics section of the 1932 meeting of the American Society of Animal Production:

The Evidence for Genetic Resistance to Bacterial Disease in Animals, by W. V. Lambert (pp. 265-269); The Effect of Selection on the Resistance of a Population, by J. W. Gowen (pp. 269-271); The Commercial Possibilities and

Limitations of Breeding for Disease Resistance, by L. J. Cole (pp. 271, 272); The Inheritance of Milk Production and Butterfat Percentage in a Herd of Purebred Ayrshire Cattle, by E. E. Heizer (pp. 273-277); Breeding Results in a Herd of Cattle Infected with Contagious Abortion, by W. W. Yapp and A. F. Kuhlman (pp. 277-281); Foetal Resorption in Animal Husbandry, by R. B. Hinman (pp. 282, 283); The Sex Ratio in the Mule, by W. A. Craft (pp. 283-285); and Multiple Births in Sheep, by I. Johansson (pp. 285-291).

This supplements the list of papers in animal production (page 404).

Variability and individuality, C. C. LITTLE (*Science*, 77 (1933), No. 1990, pp. 195-197).—Data are cited which show greater variability in the size of litters born to young and old mice than was observed in the litters of medium-aged dams. Similar results are cited on the crossing over in *Drosophila* females of different ages. The data suggest that there is more variability in the offspring of old and young dams than in the offspring of medium-aged dams, emphasizing the importance of recognizing the part played by the age factor in variability and individuality.

On the inheritance of markings in black-spotted Holstein cattle [trans. title], M. SOMMER (*Wiss. Arch. Landw., Abt. B, Arch. Tierernähr. u. Tierzucht*, 8 (1932), No. 1, pp. 110-149, figs. 2).—An analysis was made of the inheritance of black spotting in the three herds of cattle previously discussed by Lauprecht (*E.S.R.*, 56, p. 223). A single pair of Mendelian factors seemed to explain the inheritance of markings on the head and over the body with dominance incomplete. From the theoretical determination of the genotype of the parents it was concluded that the offspring should occur in the following proportions, 218 AA, 326 Aa, and 121 aa; whereas the numbers observed were classed phenotypically as 227 AA, 320 Aa, and 118 aa. In these matings A refers to spotting and a is the solid color.

[Multinipple sheep] (*New Hampshire Sta. Bul.* 270 (1933), p. 6).—A progress report is given by E. G. Ritzman of the results of crossing Southdown-Rambouillet sheep with the multinipple strain established by Alexander Graham Bell.

Studies on inbreeding in some degenerating breeds of dogs [trans. title], E. F. LISITSKIÏ (LISSITZKY) (In *Trudy Vsesoiūznogo S"ezda po Genetike, Selektzii, Semenovodstvu i Plemennomu Zhivotnovodstvu* (Proceedings of the U.S.S.R. Congress of Genetics, Plant- and Animal-Breeding), Leningrad, 1929. Leningrad: Izd. Redaktsionnoi Kollegii S"ezda, 1930, vol. 6, pp. 155-162, figs. 2; Ger. abs., pp. 161, 162).—Inbreeding in bulldogs was found to result in such abnormalities among the offspring as harelip and wolf neck, and it lowered disease resistance, reduced fertility, and caused sterility. The mortality before and during the first month after birth and susceptibility to a variety of diseases were increased.

Lethal action in the short-tailed mutation in the house mouse, P. CHESLEY (*Soc. Expt. Biol. and Med. Proc.*, 29 (1932), No. 4, pp. 437, 438).—A study of the embryos in brachyury × brachyury matings showed that death of about one fourth of the mice occurred during the third quarter of the tenth day of pregnancy. Deformities were present in homozygous embryos removed from the uterus early on the tenth day. Resorption of these embryos had started on the eleventh day. Of 256 embryos examined on the eighth, ninth, and tenth days of gestation, 60 were abnormal and were designated as homozygous for the short-tailed character.

Inheritance of rate of growth in domestic fowl.—I, **Methods and preliminary report on results obtained with two breeds**, M. LERNER and V. S. ASMUNDSON (*Sci. Agr.*, 12 (1932), No. 11, pp. 652-664, figs. 5).—Data are re-

ported on the rate of growth in weight and length of the tarsometatarsus to 12 weeks of age for males and females of the Ancona and Light Sussex breeds and the F_1 , F_2 , and backcross generations of the F_1 s to the parents. The rate of growth was determined by the formula $\frac{100 (W_2 - W_1)}{\frac{1}{2} (W_1 + W_2)}$, wherein W_1 was the original weight and W_2 the final weight. The data indicate inherent differences in the rate of growth of the two breeds. A close correlation of $+0.752 \pm 0.045$ was found between weight and length of the tarsometatarsus, but genetic differences were apparent. The correlations between rate of growth and weight and tarsometatarsal length were not significant. The F_1 generation was less variable than the F_2 s, but only slightly so and not in all cases. The greater growth rate seemed dominant, but it was suggested that a complex of factors is involved.

Investigations of the developmental physiology of bird feathers [trans. title], O. KUHN (*Ztschr. Wiss. Biol., Abt. D, Arch. Entwickl. Mech. Organ.*, 127 (1932), No. 3, pp. 456-541, figs. 78).—A description is given of feather development and the influence of position on the body, age, and season on the development and pigmentation of feathers.

On the morphogenesis of the fat-rump ("kurdiuk") and the tail of the sheep [trans. title], S. N. BOGOLÛBSKIÏ (BOGOLUBSKY) (In *Trudy Vsesoiûznogo S"ezda po Genetike, Seleksii, Semenovodstvu i Plemennomu Zhivotnovodstvu* (Proceedings of the U.S.S.R. Congress of Genetics, Plant- and Animal-Breeding), Leningrad, 1929. Leningrad: Izd. Redaktsionnoi Kollegii S"ezda, 1930, vol. 6, pp. 53-59, figs. 3; Ger. abs., pp. 57-59).—Studies of the morphology of the fat rump and tail of sheep were made on embryos. These showed that the tail and fat-rumped characters developed at a relatively early age.

Is there an acquired specific poison supersensitivity transferred to the offspring? [trans. title] A. BLUHM (*Biol. Zentbl.*, 52 (1932), No. 11-12, pp. 667-673).—Data are presented from experiments with mice to indicate that the offspring to parents sensitized to ricin are themselves supersensitive to this toxin. The findings are based on the mortality and growth rates of the young of both sexes from treated and control parents. Tests with other toxins, such as the venom from the cobra and puff adder, are also reported.

There was a sex difference in the transmission of the sensitivity to the poisons, as the offspring of females from the immunized strains mated with normal males showed greater survival when treated with the poisons than the offspring of males from the immunized strains mated with normal females.

The physical chemistry of sexuality, P. JOYET-LAVERGNE (*La Physico-chimie de la Sexualité*. Berlin: Borntraeger Bros., 1931, pp. XI+457, figs. 12).—Various aspects of sexuality in plants and animals are discussed, including differences in the chemistry and metabolism of the two sexes.

Development of the human ovary from birth to sexual maturity, C. S. SIMKINS (*Amer. Jour. Anat.*, 51 (1932), No. 2, pp. 465-505, pls. 6).—The growth of the human ovary from the sixth fetal month to maturity is reported. The estimated number of primordial follicles in the ovary showed a decrease from 143,000 at birth to 10,500 at 14 years of age. Delivery of germ cells from the germinal epithelium ceases at the sixth month of fetal life, and the oogonia no longer multiply by mitosis.

The normal development of the mammary gland of the male and female albino mouse, C. W. TURNER and E. T. GOMEZ (*Missouri Sta. Res. Bul.* 182 (1933), pp. 43, figs. 64).—In the two parts of this bulletin dealing with the intrauterine and extrauterine life, the normal development of the mammary gland of the male and female albino mouse is described from its earliest

appearance in the 10-day-old embryo through birth, puberty, pseudopregnancy, pregnancy, lactation, and involution in a manner similar to the descriptions of the development of the mammary gland in cattle and rats (E.S.R., 66, p. 424).

A study of the cytoplasmic inclusions and nucleolar phenomena during the oogenesis of the mouse, R. A. R. GRESSON (*Quart. Jour. Micros. Sci. [London]*, n. ser., 75 (1933), No. 300, pp. 697-721, pls. 2, figs. 9).—The results are reported of a study of oogenesis in the mouse, giving special attention to the Golgi apparatus in the developing ovum in the ovary and in ova fixed in the Fallopian tubes at short intervals after mating.

Effects of hypophyseal extracts on sexually immature monkeys, F. L. HISAW, H. L. FEVOLD, and S. L. LEONARD (*Soc. Expt. Biol. and Med. Proc.*, 29 (1931), No. 2, pp. 204-206).—The daily administration to immature monkeys of extracts of the anterior lobe of the hypophysis equivalent to 1 g of dried pituitary powder was followed in from 2 to 3 days by a purplish coloration of the perianal region and a reddening of the nipples. Neither these injections nor those continued up to from 14 to 16 days caused corpus luteum effects, and ovulation did not occur.

Long continued injections of acid extract of anterior pituitary on thyroid gland and sex organs, L. LOEB and H. FRIEDMAN (*Soc. Expt. Biol. and Med. Proc.*, 29 (1931), No. 2, pp. 172-174).—In studying the influence of long continued injections of an acid extract of the anterior lobe of the pituitary, doses of from 47 to 135 cc of the extract were administered to 10 guinea pigs weighing from 185 to 205 g over periods of from 47 to 74 days. In some animals a marked hypertrophy of the thyroid glands occurred with little gain in body weight; whereas in others the thyroid glands were not greatly changed in size and normal growth occurred. The ovaries varied from normal in animals without the thyroid hypertrophy, and normal weight increased to hypotypical ovaries with much interstitial tissue and the secondary sex glands in the resting stage. There was a marked difference in the ability of young guinea pigs to tolerate heavy doses of the anterior pituitary extracts over long periods.

Effects of castration leaving the epididymis intact in the rat, J. J. LAWLESS (*Soc. Expt. Biol. and Med. Proc.*, 29 (1931), No. 2, p. 232).—The removal of the testes, leaving the epididymis intact, in eleven 3-weeks-old rats had no different effect on the rats as determined at 80 days of age than complete castration.

The anterior pituitary sex hormone of normal and semicastrated rats. F. E. EMERY, P. W. BASH, and W. R. LEWIS (*Soc. Expt. Biol. and Med. Proc.*, 29 (1931), No. 1, pp. 42-44).—In determining the influence of semicastration of male and female rats on the secretion of the hormone of the anterior lobe of the pituitary gland, two pituitary glands were removed from experimental animals and grafted into recipients at 25 and 26 days of age. The ovaries and uteri from the test animals were dissected at 30 days of age. Grafts from normal and semicastrated donors produced equal development of the ovaries and uteri in the immature animals, but the pituitaries from males were more potent than those from females.

The absence of gonad-stimulating hormone in the urine and blood of patients with pituitary tumors, J. W. WATTS (*Soc. Expt. Biol. and Med. Proc.*, 29 (1932), No. 4, pp. 396-399).—No gonad-stimulating hormone was demonstrated in the blood or urine of 7 men and 7 women with pituitary tumors when total injections of as much as 7.5 cc of blood and 24 cc of urine were administered to immature rats.

Gonad-stimulating hormones in hypophysectomised animals, J. B. COLLIP, H. SELYE, and D. L. THOMSON (*Nature [London]*, 131 (1933), No. 3298,

p. 56).—Studies of more than 600 hypophysectomized rats showed that the resulting degeneration of the germinal epithelium and interstitial tissue of the testes and the secondary sex glands was prevented, except for the degeneration of the germinal epithelium, by treatment with the anterior pituitary-like hormone of the human placenta.

Prolan, the hormone from pregnancy urine, was found to act on the ovaries of hypophysectomized females. Females operated on before sexual maturity failed to show oestrus, and pseudocorpora lutea developed in the ovary; whereas females operated on after maturity showed continuous oestrus after administration of pregnancy urine.

Hypophysectomy after parturition leads rapidly to failure of milk secretion. Hypophyseal implants permitted complete normal growth and glandular development.

The gonadotropic hormones (ρ -factors).—III, **Further purification and properties of the active principles**, P. G. MARSHALL (*Biochem. Jour.*, 26 (1932), No. 4, pp. 1358–1364).—Continuing this series (*E.S.R.*, 69, p. 33), a product was obtained through ultrafiltration which contained 200 mouse units per milligram of the ρ -factor. Rupture of the follicles with probable ovulation in 24 hours was induced in the rabbit. Purification tests with phosphotungstic acid and permutit gave negative results. The chemical composition of the purified substance is given.

The assay of testicular hormone preparations, V. KORENCHEVSKY (*Biochem. Jour.*, 26 (1932), No. 2, pp. 413–422).—Litter-mate pairs of control rats and rats injected with testicular hormone preparations were dissected, and the deviations from the average in the weights of the prostate and seminal vesicles, penis, adrenals, thyroids, hypophysis, and retroperitoneal fat per unit of body weight were compared. Castration results in a decrease in the weight of the prostate, seminal vesicles, penis, and thyroids, and an increase in the weight of the hypophysis, adrenals, and body fat, but injection of the testicular hormone resulted in a change in the organs toward the normal. As a simple and sensitive test an increase of 40 percent in the weight of the seminal vesicles and prostate is suggested as a positive finding for the presence of testicular hormone in the material under test.

Castrated rats for the assay of testicular hormone, V. KORENCHEVSKY (*Biochem. Jour.*, 26 (1932), No. 4, pp. 1300–1305).—The weights of the sexual and endocrine organs, noted in the preceding paper, were found to vary in 88 rats depending on whether castration was performed before or after sexual maturity. The weights of the organs are given for the different aged animals castrated before and after maturity. Special emphasis is given to the importance of having the animals at the same age at castration and when killed for determining the testicular hormone present in comparable experiments.

The response of castrated male rats to the injection of testicular hormone, V. KORENCHEVSKY, M. DENNISON, and R. SCHALIT (*Biochem. Jour.*, 26 (1932), No. 4, pp. 1306–1314).—Continuing the above studies, it was found that the increase in the size of the prostate and seminal vesicles of males castrated before sexual maturity gave the most sensitive test for the assay of the testicular hormone, and that the penis and thymus were more variable and less sensitive. Rats belonging to different litters showed similar response to the same dose of testicular hormone, provided they were tested at similar intervals after castration and provided that castration was performed either before or after sexual maturity in both cases.

The increase in the size of the prostate and seminal vesicles was correlated with the size of the dose. The minimum dose for seven daily injections that

will induce an increase of 40 percent in the weight of the seminal vesicles and prostate of three litters of rats castrated before 30 days of age is suggested as the standard for a rat unit of testicular hormone.

The influence of the freshness of the testes and of desiccation of the testicular tissue on the yield of testicular hormone, V. KORENCHEVSKY, R. SCHALIT, and D. GRAETZ (*Biochem. Jour.*, 26 (1932), No. 2, pp. 423-428).—In a series of five experiments it was shown that the yield of testicular hormone was greater from fresh testes than from testes kept for about 20 hours at room temperature before extraction. On the contrary, drying of testes did not appreciably decrease the yield of the hormone provided the testes were first boiled in acidulated water to destroy all germs. The dried material was then extracted with benzene. Such extracts were compared with extracts of fresh tissue prepared by the method of Gallagher and Koch.¹

The development and morphology of the gonads of the mouse.—IV, The postnatal growth of the testis, I. W. ROWLANDS and F. W. R. BRAMBELL (*Roy. Soc. [London], Proc., Ser. B*, 112 (1933), No. B 776, pp. 200-214, figs. 9).—Continuing this series (*E.S.R.*, 60, p. 219), data are reported on the development of the testes of the mouse from birth to 300 days of age. The area of spermatic tubules was determined with reference to age and cleaned body weight. The maturation of the testes was also studied, and the maximum number of primary spermatocyte nuclei in pachynema was observed on the fourteenth day, with the first appearance of mature sperm on the forty-second day of age. The maximum growth rate of the testes occurred at from 30 to 40 days of age, when the largest area of spermatic tubules was observed in comparison with the area of intertubular material in the testes. No general wave of germ-cell degeneration was observed between birth and maturity.

Homology of prooestrous bleeding in the dog, R. K. MEYER and S. SAIKI (*Soc. Expt. Biol. and Med. Proc.*, 29 (1931), No. 3, pp. 301-303).—Evidence is presented to indicate that prooestrous bleeding in the bitch is not homologous with the menstruation of primates. Prooestrous bleeding in the dog is due to direct or indirect action of the oestrous hormone on the uterus.

The chemical and physiological properties of crystalline oestrogenic hormones, J. S. L. BROWNE (*Canad. Jour. Res.*, 8 (1933), No. 2, pp. 180-197).—The chemical nature of a crystalline substance exhibiting oestrogenic properties is described. The substance was active on immature rats, but relatively inactive on ovariectomized adults. The response of castrated females was restored by ovarian grafts.

A synthetic oestrus-exciting compound, J. W. COOK, E. C. DODDS, and C. L. HEWETT (*Nature [London]*, 131 (1933), No. 3298, pp. 56, 57).—In studies of synthetic oestrus-exciting compounds it was found that "1-keto-1:2:3:4-tetrahydrophenanthrene is capable when injected into castrated animals of inducing oestrus of an exactly similar type to that obtained by the injection of oestrin."

External evidence of hormone action following injection of urine of pregnant women into rabbits and guinea pigs, E. L. and A. G. KING (*Soc. Expt. Biol. and Med. Proc.*, 29 (1932), No. 4, pp. 469, 470).—In an attempt to develop a pregnancy test which might be employed without sacrificing the test animal, it was found that the vaginal smear of rabbits and the opening of the vaginal membrane in guinea pigs injected with pregnancy urine were unreliable.

Effect of theelin on immature guinea pigs, E. L. and A. G. KING (*Soc. Expt. Biol. and Med. Proc.*, 29 (1932), No. 9, pp. 1060-1063).—The use of immature guinea pigs for demonstrating the presence of theelin by enlargement of

¹ *Jour. Biol. Chem.*, 84 (1929), No. 2, pp. 495-500.

the uterus is suggested. In the normal animal the ratio of the weight of the uterus in milligrams to the body weight in grams is 2.5. Uterine hypertrophy may be observed within 48 hours after the injection of the substance containing theelin. Pregnancy urine caused uterine hypertrophy, but no hypertrophy followed injections of a preparation of the hormone of the anterior pituitary.

Attempted induction of labor by injections of theelin, J. T. WITHERSPOON (*Soc. Expt. Biol. and Med. Proc.*, 29 (1932), No. 9, pp. 1063, 1064).—Subcutaneous injections of theelin into eight pregnant negro women at full term were considered to be without effect, in the amounts given, in inducing labor.

Effects of X-rays in an inbred strain of guinea-pigs, H. H. STRANDOSKOV (*Jour. Expt. Zool.*, 63 (1932), No. 1, pp. 175–202, figs. 8).—The effects of X-ray treatments of from 2 to 30 minutes on the scrotal area of 85 closely inbred male guinea pigs are reported. Histological study of the testes showed that the treatment caused varying degrees of degeneration in the tubules, but in all cases a new functional epithelium was regenerated in less than 40 weeks. Studies of the semen samples produced by the ejaculation after electrical shocks showed that active sperm were not present for a certain period following X-ray treatment, but that duration of this period was related to the length of X-ray treatment.

In further study of the effect of the X-ray treatment, the treated males were each mated with two females. The litters sired by the X-rayed males averaged 2.04 ± 0.097 young as compared with 2.69 ± 0.079 for the controls. In addition to reducing litter size, the X-ray treatment increased the percentage born dead from 14.36 in the controls to 26.01 among the offspring of the treated males. The young raised to weaning were slightly lighter at birth in the group sired by treated males than in the control stock. The young of the treated males showed a small excess of males. The second and third generations following the treatment did not show effects which could be attributed to the X-ray treatments, and no visible mutations were observed.

FIELD CROPS

[Field crops experiments in Maine] (*Maine Sta. Bul.* 363 (1932), pp. 250–254, fig. 1).—Brief accounts are presented on the progress of experiments by J. B. Chucka and D. B. Lovejoy at Aroostook Farm, including comparisons of fertilizer formulas, carriers of phosphorus and of potash, “uncommon” elements and green manures, and a fertilizer placement study, all with potatoes; and variety tests with oats, barley, spring and winter wheat, rye, and flax for seed.

[Crops experiments in New Hampshire] (*New Hampshire Sta. Bul.* 270 (1933), pp. 6–8, 12).—Agronomic studies reported on briefly included a dairy farm rotation on neglected hay lands, a fertilized potato rotation, variety tests with soybeans, fertilizer tests with soybeans, sweetclover, and alfalfa, and a study of the effects of top-dressing old pastures, all by F. S. Prince, P. T. Blood, T. G. Phillips, and G. P. Percival; and control of poison ivy by applications of kainit, by O. Butler.

[Recent results of field crops research in Oregon] (*Oregon Sta. [Pamphlet, 1933]*, pp. 4–7, 12, fig. 1; *Branch Sta. [Pamphlets, 1933]*—*Harney Sta.*, pp. 4–6, 7, figs. 2; *Hood River Sta.*, p. 5; *John Jacob Astor Sta.*, pp. 3–5, figs. 3; *Pendleton Field Sta.*, pp. 1–8, figs. 5; *Sherman Sta.*, pp. 1–8, figs. 2; *Southern Oregon Sta.*, p. 5; *Umatilla Sta.*, pp. [4–6, 7, 8], figs. 3; *Oregon Livestock Sta.*, pp. 6–8, figs. 2).—Outstanding results obtained in experiments with field crops

(E.S.R., 64, p. 333) at the station and the Harney (Burns), Hood River, John Jacob Astor (Astoria), Pendleton, Sherman (Moro), Southern Oregon (Talent), Umatilla (Hermiston), and State Livestock (Union) Substations, often in cooperation with the U.S. Department of Agriculture, are reported in popular summaries. The work reviewed comprised variety trials with winter and spring wheat, oats for grain and hay, barley, rye, seed flax, field peas, vetch, alfalfa, sweetclover, miscellaneous grasses and forage legumes, potatoes, turnips, carrots, mangels, rutabagas, soiling crops, and combinations for silage; trials of Jerusalem-artichokes; breeding work with wheat, barley, and oats; cultural experiments with alfalfa and sweetclover; seed production studies with alfalfa; hay measuring and weighing investigations; comparisons of seed bed preparation methods and of crop residues for wheat; soil moisture and nitrate studies; fertilizer trials with wheat, potatoes, and alfalfa; crop rotations; and control of quackgrass. Varieties of merit developed or introduced by the station are noted.

Yield and chemical composition of certain pasture crops, fertilized and unfertilized, M. S. GRUNDER (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 4, pp. 375-386).—Italian ryegrass, a mixture of grasses and clovers for bottom land, and white clover, sown on untreated and on fertilized and limed plats on sandy soil at the Western Washington Experiment Station, were cut fortnightly during the 1930 growing season. A period of heavy production during May and June was followed by a constant drop in the production for the remainder of the season.

The total yields of dry matter per acre for the season of the different crops were for Italian ryegrass, fertilized 7,818.8 lb., unfertilized 6,041.8; bottom-land mixture, fertilized 7,618.8; unfertilized 6,522.4; and white clover, fertilized 6,604.1, unfertilized 5,314.2 lb. The respective percentages of crude protein for the season were 23.42, 23.17, 25.23, 26.28, 29.63 and 28.5.

Yields of dry matter and crude protein were usually higher through the season in the fertilized crops. The percentage of crude protein was maintained at a high level through the season by the cutting treatment, and tended to increase during the fall months. The presence or absence of clover seemed to exert a greater influence on the content of protein or calcium or the calcium-phosphorus ratios than did the fertilizer. The fiber, ether extract, and crude ash contents were consistently the higher in the fertilized crops. Under the conditions, the increased yield of dry matter was a more important result of fertilizer treatment than was any increase in protein, calcium, or phosphorus percentages.

Growing root crops for livestock, H. L. WESTOVER, H. A. SCHOTH, and A. T. SEMPLE (*U.S. Dept. Agr., Farmers' Bul. 1699* (1933), pp. II+13, figs. 2).—Cultural methods and harvesting practices involved in growing mangels, rutabagas, turnips, and carrots for livestock are outlined, together with information on varieties, storage methods, comparative composition, feeding the crops to cattle, sheep, horses, hogs, and poultry, production costs, yields, and insect pests and diseases.

Influence of light, temperature, and soil moisture on the hardening process in alfalfa, H. M. TYSDAL (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 6, pp. 483-515, figs. 10).—The third of a series on hardness in alfalfa (E.S.R., 67, p. 379), this paper, based on cooperative investigations between the U.S. Department of Agriculture and the Nebraska Experiment Station, deals with the influence of light, temperature, and soil moisture on the ability of different alfalfas to survive cold. Plants of Turkestan, Grimm, and Arizona common alfalfa, grown for 30 days in the warm greenhouse, served as the principal

material, and 14 days was the standard period in the hardening room. Equipment used was described earlier by Peltier (E.S.R., 66, p. 21).

The length of day was found to have a very important influence on the hardening process. The hardier varieties hardened off much more under a short day length than under a normal day length, but this response was confined to certain temperature ranges. Practically no response to a 7-hour day at 20° or at 0° C. was observed, but at 10° to 12° the response was very marked. Of the three varieties studied, Turkestan, the hardiest, responded most to the short day, and the unhardy, Arizona common, responded least. Intensity of light was also important in the hardening process, but only when the light reached a minimum beyond which a reduction caused a weakening of the plant. Above this minimum the response was not so marked as the response to day length. The short day at both medium and high temperatures greatly reduced growth, which was reflected in a high percentage survival of plants at the medium but not at the high temperatures, indicating that reduced growth is not a criterion of hardening. Plants hardened under white light could withstand cold better than those hardened under red or blue light.

Resistance to freezing varied with the temperature at which plants were hardened. From 20° to about 0° the percentage survival increased as the temperature was lowered. Plants taken directly from a warm room to a hardening room at -5° were killed outright. At the range of optimum activity, light seemed to influence hardening almost as much as temperature, because for each hour of shortening in day length from a 10.5-hour day to a 7-hour day there was an increase in survival of 16, 6.3, and 1.4 percent for Turkestan, Grimm, and Arizona common, respectively, while for each 1° of decrease in the hardening temperature the increase in survival was 12, 10, and 6 percent.

Alternating temperatures during hardening markedly increased cold resistance, although this was influenced also by the time of day that plants were subjected to the cold and by the temperature of the hardening room. Indications were that alternating temperatures with light during the warm periods furnish the optimum conditions for hardening. Plants kept at 0° for 16 hours and then placed in a warm greenhouse (approximately 20°) during the day for 8 hours developed much greater hardiness than those kept continuously at 0°. This was true at all temperatures up to about 5° for Arizona common and 7° for Turkestan. Two or 4 hours in a hardening room at 3.8° also greatly increased the hardiness of the plants, the 4-hour plants being about equal in hardiness to those kept continuously at 3.8°.

A reduction in the soil moisture to as low as the incipient wilting point did not harden any of the varieties markedly, being often overshadowed by the rapidity and degree of freezing of the dry soil as compared to the moist soil. Plants in the moistest soil invariably gave the highest percentage of survival when frozen for the same length of time as the low-moisture set. If they were frozen until the soil temperatures in the two sets were the same, the survival slightly favored the plants hardened in the low-moisture soil. Plants kept severely wilted for 10 to 14 days and then frozen in the severely wilted condition were very much more resistant to cold than those watered normally. The close correlation between natural conditions in the fall, such as decreasing day length and alternating temperatures, and the effect on the hardening process of similar factors under controlled conditions is pointed out.

A statistical study of certain characters of the alfalfa plant concerned with seed production, B. DANN and L. R. WALDRON (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 3, pp. 184-190).—In a statistical study at the North Dakota Experiment Station of data on characters of alfalfa plants grown in the Halle

(Germany) University garden, with four independent variables distinctly significant correlations were found between weight of seed per plant (dependent) and weight of plant, pods per racemes, and seeds per pod, for the zero, first, second, and third orders. Only total racemes was correlated positively and significantly with weight of plant for the various orders. As to the partial regression coefficients, a deviation of but 12 percent in plant weight accounted for a deviation of 10 percent in weight of seed per plant. A relatively enormous deviation of racemes per plant was required to result in a similar deviation of seed. The multiple correlation coefficient of the four independent variables on weight of seed per plant was 0.84.

The influence of the maturation environment upon the permeability of the seed-coat of barley, W. H. THARP (*Amer. Jour. Bot.*, 19 (1932), No. 10, p. 836).—Permeability studies were conducted at the University of Wisconsin with three hull-less and two hulled varieties of barley, grown under a natural relatively dry environment and under a field moist-cage where high soil moisture and humidity were maintained during maturation. A different rate of solute permeation was found for each variety tested. Samples matured under the moist-cage were more permeable than samples of the same barley matured in the drier condition, and grains harvested prematurely were more permeable than similar fully-matured kernels. These differences in relative permeability could not be correlated with any comparable variation in the anatomical structure of the seed-coat membranes. Microchemical tests failed to differentiate between the membranes from samples of barley exhibiting wide differences in rate of permeability.

The effect of seed inoculation and of a nitrogen fertilizer on the survival of red clover plants growing in soil previously treated with sodium chlorate, W. E. HAINES (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 3, pp. 181-183).—Red clover seed sown in Minnesota Experiment Station studies at weekly intervals for 10 weeks in pots containing soil treated with sodium chlorate in solution survived best with inoculation and addition of ammonium sulfate, next best with inoculation alone, and the increase was lowest, yet significant, with ammonium sulfate alone. The percentage survival was considerably larger on untreated soil. With plants growing in chlorate-treated soil, there was a correlation of 0.65 ± 0.4 between the percentage of plants surviving from a treatment and the average nodules per plant on the plants surviving from the treatment.

The production and utilization of corn grown under irrigation in Washington, H. P. SINGLETON (*Washington Col. Sta. Bul.* 278 (1933), pp. 22).—Experiments with corn at the Irrigation Substation near Prosser showed that both early and late varieties have outyielded all small grains in the period 1922-32, and that both had greater feed value per ton. Late varieties, as Reid, Iodent, and certain local yellow strains surpassed early strains somewhat in yield, while Johnson County White and other very long-season varieties did not seem adapted for grain. Thayer Yellow and Windus White outyielded other early corns. Other tests and experience suggested planting as soon as frost danger is past; rows 36 to 42 in. apart for Reid and 36 in. or less for Thayer; drilling not closer than 14 to 16 in., nor checking more than 3 plants per hill; about 3 irrigations after planting on most soils and possibly 2 on heavy soils; and cultivation enough to control weeds. The comparative feeding values of eastern corn, local corn, and small grains and of silage have been noted earlier (*E.S.R.*, 52, pp. 672, 767; 66, pp. 359, 765).

Cotton experiments at the Lawton (Oklahoma) Field Station, 1916-1931, W. M. OSBORN (*Oklahoma Sta. Bul.* 209 (1933), pp. 31, figs. 2).—Variety, date-of-planting, and spacing tests with cotton made in cooperation with the

U.S. Department of Agriculture are reviewed for the period 1916-31, and meteorological data are tabulated with remarks on the crops in the different years. Total seasonal precipitation was not so important as seasonal distribution; about 61 percent of the annual rainfall was received from April to September, inclusive.

While short-staple, early-maturing varieties produced slightly more lint than medium early cottons stapling $\frac{1}{2}$ to 1 in. and large-boll, late-maturing sorts with similar staple, the medium type was more desirable when yields, staple, storm resistance, fiber quality, lint percentage, and boll size were considered.

Plantings made May 1 and 15 returned highest average yields. Variety and season affected staple length and lint percentage more than did time of planting. Difficulty in obtaining a uniform stand from early plantings was not overcome by thick seeding.

Spacing single plants 18 in. apart in 44-in. rows produced highest average lint yields over 7 years. Two plants per hill returned somewhat lower yields regardless of spacing between plants or row width. Wide rows did not increase the lint yield. Thick spacing hastened maturity. The spacing had slight influence on the average lint percentage or staple length.

Development of the female gametophyte and embryo in cotton, U. R. GORE (*Amer. Jour. Bot.* 19 (1932), No. 10, pp. 795-807, pls. 2).—The development of the female gametophyte and early stages of embryo development were studied in Sea Island, Pima Egyptian, and upland cottons of the Delfos 6102 and Mebane varieties at the Texas A. and M. college.

The embryo sac was observed to develop from the chalazal megaspore of the tetrad, the complete structure being very long and embedded in many layers of nucellus. The antipodals degenerate early, and the polars begin fusing before entrance of the male gametes to form a polar fusion nucleus. The pollen tube enters the ovule 15 to 20 hours after pollination, and by digesting its way through the nucellus reaches the embryo sac. Slight branching of the tube in the region of the integuments was noted. Fertilization is completed from 24 to 30 hours after opening of the flower. The endosperm in cotton usually results from the fusion of the second male gamete with the polar fusion nucleus. Various methods of triple fusion are reported. A massive endosperm is developed only to be resorbed by the growing embryo. The embryo develops a short suspensor.

Fiber abnormalities and pressure variations within the boll in Gossypium, W. K. FARR (*Amer. Jour. Bot.*, 19 (1932), No. 10, p. 839).—Pima Egyptian and Super Seven and Acala upland cottons showed increasing numbers of fiber abnormalities in the order named and in the ratios of 15:90:170. Very few abnormalities occurred before the twentieth day from fertilization in any one of the cottons. Measurements during the entire period of development indicated that pressure within the boll is relatively small in Pima, moderate in Super Seven, and large in Acala, and that it increases from the twentieth day until near dehiscence. The possibility was suggested that pressure may be an important factor in the formation of fiber abnormalities.

Root development of cotton plants in the San Joaquin Valley of California, J. W. HUBBARD and F. W. HERBERT (*U.S. Dept. Agr. Circ.* 262 (1933), pp. 8, figs. 5).—Records of cotton root development made under field conditions at Shafter, Calif., in 1929 and 1930 showed that cotton seedlings establish deep root systems promptly, indicating that irrigation is seldom necessary until long after planting. Plants 8 to 10 in. high and with 8 to 10 true leaves had taproots extending 50 to 60 in. below the soil surface, and even small seedlings in the cotyledon stage without true leaves had roots down 12 to 16 in. Streaks of coarse sand wherever encountered interfered with root penetration, the roots

often ending abruptly after going only a few inches into the sand, the tips having perished. Many large lateral roots developed near the soil surface on plants irrigated early in the season, while very few or no lateral roots developed near the surface on unirrigated plants. Deep penetration of roots in early growth stages appears desirable, since it affords a more constant condition for plant development.

The relation of size and shape of plant to the yield of cotton, S. N. VENKATRAMAN and C. J. RAO (*Madras Agr. Jour.*, 21 (1933), No. 2, pp. 51-58, figs. 5).—The relation of height, nodes, and number of monopodia to the yield of cotton was studied in 6,000 plants, the progeny of 46 selections of Northern cotton (*Gossypium indicum*).

In plants of the same strain, number of monopodia and plant height were correlated markedly with yield, whereas the genetic relation from strain to strain was different. While taller types were not necessarily good yielders, strains with more monopodia were more productive. The number of nodes was not of much significance toward yield, either within or between strains. The correlation of yield to other characters was significantly greater in normal plants than in those attacked by the shoot borer (*Earias* sp.). Study of the regression of plant yield on these characters showed that the relation of monopodia and, to a large extent, of height was rectilinear, indicating a proportionate increase of yield with increase in these characters. Examination of yield from plants in all strains showed attacked plants to give a significantly higher yield, this increase being associated with an increase in number of monopodia per plant and in an increased rate of productivity per monopodium. A comparison of other strains, as Cambodia and particularly Uppam (*G. herbaceum*), where the effect of the borer was the reverse, showed the difference in behavior could be attributed to the more monopodial habit of this type. The relation of yield to monopodia was much higher in this cotton than in more sympodial types.

Community production of cotton in relation to yield and staple length, J. A. SHANKLIN, R. C. CAMPBELL, and W. C. JENSEN (*South Carolina Sta. Circ.* 48 (1933), pp. 26, figs. 6).—The influence of the source and care of cottonseed for planting on the yield and length of staple produced was studied in communities in Orangeburg, Marlboro, Chesterfield, and Pickens Counties, S.C., in cooperation with the U.S. Department of Agriculture.

Most of the cotton produced in the four communities was grown on Norfolk, Portsmouth, and Marlboro sandy loams, Johnson loam, Cecil sandy clay loam, and Georgeville clay loam. Each community produced cotton as the chief money crop, and the soils in each community are considered ideal for cotton production. The 329 growers included 91 growers of cotton from pure seed of improved varieties, 77 of cotton from mixed seed of improved varieties, 130 of run-down short staple cotton, and 31 producers of long staple cotton. The total production was 5,139.6 bales on 8,758 acres.

The yield of lint per acre from pure seed of improved cotton averaged 349.4 lb., compared with 294.9 lb. for cotton produced from mixed seed of improved varieties and 263.3 lb. for the run-down short staple varieties. Only 5.8 percent of the total acreage was long staple cotton, and only two communities produced this type, but the long staple cotton outyielded the run-down short staple group by a few pounds to the acre. Of the cotton from pure seed 73.7 percent stapled 1 in. or longer as compared with 76.9 percent for mixed seed of improved varieties. No untenderable cotton was produced from pure seed, and only 1.9 percent of the cotton from mixed seed was classed untenderable. In the run-down short staple group only 3.3 percent of the cotton was 1 in. or longer, while 26.9 percent of the lint was untenderable. Of the long staple cotton, 96.9 percent was 1½ in. or longer. In all communities the pure seed of

improved varieties produced the highest yield per acre. No data collected justified the planting of run-down short staple varieties, for they are the lowest yielders and also have a much shorter staple.

Mechanical application of fertilizers to cotton in South Carolina, 1931, G. A. CUMINGS, A. L. MEHRING, J. J. SKINNER, and W. H. SACHS (*U.S. Dept. Agr. Circ. 264* (1933), pp. 32, figs. 15).—Experiments on methods of applying fertilizers to cotton in South Carolina (E.S.R., 66, p. 427) were continued under similar cooperation on Norfolk very fine sandy loam at the Pee Dee Substation, on Norfolk coarse sand at the Sandhill Substation, and on Cecil sandy clay loam at Clemson College.

Under conditions prevailing in 1931, 800 lb. per acre of 4-8-4 fertilizer drilled either in bands 1.5 or more inches to each side or 4 in. directly below the seed apparently did not affect germination injuriously. On Cecil sandy clay loam the appearance of seedlings was delayed greatly and the final stand was reduced seriously only when all the fertilizer was placed in contact with the seed, but on Norfolk coarse sand and Norfolk very fine sandy loam this happened also when the fertilizer was placed below the seed either in bands at depths of 3 in. or less when mixed with the soil and when one eighth or one fourth of the fertilizer was placed in contact with the seed.

The movements of soluble salts in the sandy soils from the original position of the fertilizer into the seed zone during the germination period were insignificant from placements at the sides, although serious from placements directly below the seed. The degree of delay or injury to germination was related closely to the amount of soluble salt carried into contact with the seed. The seedlings came up most rapidly when the method of application produced in contact with the seed a soil solution containing between 0.05 and 0.2 percent of soluble salts. As the concentration rose from 1 to 3 percent, fewer and fewer plants came up, and when the solution contained 3 percent or more no plants came up. Soluble salts spread farther from the point of application in the coarse sand than in the sandy clay loam.

Highest cotton yields were obtained with side placements on the sandy soils, while on the clay loam with heavy rainfall during germination, the most seed cotton was obtained with bands placed 1 in. below the seed, although good yields were also made with side placements. No advantage was gained either in mixing the normal amount of fertilizer with soil or in placing one eighth or one fourth of the application in contact with the seed and the remainder at the sides or below the seed.

Equivalent quantities of the 4-8-4 and 8-16-8 fertilizers produced similar results. On the sandy clay loam where the final stand was good, increase in the application rate of the 8-16-8 fertilizer from 200 to 400 and 600 lb. per acre gave higher yields for the three representative placements, but on the very fine sandy loam and coarse sand increased yields were made only when fertilizer was placed in bands 3.5 in. to each side and 2 in. below the seed level. On sandy soils, when the fertilizer was placed below the seed or mixed with the soil the consequent reduction of stand gave lower yields.

Hard seed in Korean lespedeza, G. K. MIDDLETON (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 2, pp. 119-122, fig. 1).—Germination tests on well-matured Korean lespedeza seed, made by the North Carolina State Department of Agriculture at monthly intervals from November 1931, through March 1932, showed a rapid decrease in hard-seed content and a corresponding increase in germination for each sample from November through January, but with very little further change by March. The average percentages of hard seed were for November, 47.25; January, 12.25; and March, 11.05; and of germination were 46.7, 83.3, and 84.85, respectively. The conclusion that for satisfactory results germina-

tion tests should be delayed at least until January following harvest was substantiated by numerous tests during three years. With tests made early in the season, the total viable seed content seemed to be a more reliable guide to agricultural value than is germination alone. For well-matured, bright, plump seed, deduction of 15 percent from this total, as determined in the fall, proved a safe estimate of the actual germination obtained the next spring.

Size of Korean lespedeza seed in relation to germination and hard seed, G. K. MIDDLETON (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 3, pp. 173-177, fig. 1).—Germination tests on samples of Korean lespedeza seed, separated into different sizes by screens, showed a definite relationship between size of seed and hardness. The smaller seed had the higher percentage of hard seed, and seed intermediate in size was intermediate in this respect. In the samples used maturity did not obscure the relationship existing between size and hardness. It seemed that where second-grade seed are to be used, field tests should be delayed as late as possible, and the seeding rate based on actual germination. The data presented are not in conflict with those noted above.

Natural crossing with wild oats, *Avena fatua*, R. A. DERICK (*Sci. Agr.*, 13 (1933), No. 7, pp. 458, 459).—Natural crossing amounting to 0.1 percent was obtained at the Ottawa farm when small blocks of *A. fatua* were sown in the midst of a larger block of *A. fatua*. The prevailing west wind caused considerably more natural crossing than the north wind, while east and south winds had no effect.

Studies of potato storage, O. SMITH (*New York Cornell Sta. Bul.* 553 (1933), pp. 57, figs. 23).—Studies were made on the influence of the stage of maturity of the tubers at time of harvest; careful harvesting and handling methods; storage temperature and humidity for a brief period immediately after digging; and temperature, humidity, and evaporating power of the air during storage, on the physiological and decay loss in weight of potatoes, the respiration rate of the tubers, and the rapidity and extent of suberization and wound-periderm formation. Other studies dealt with the portion of the storage period in which tubers lose the most weight; the effect of depth of piling on loss in weight and on temperature, composition, and evaporating power of the air within the bin of potatoes; and the amount of shrinkage of potatoes in several types of commercial storage houses. The experiments were carried on in two potato-storage houses at Ithaca, N.Y., and five houses of various types located within 50 miles of Ithaca, during the years 1929-32.

The greatest shrinkage losses of potatoes were observed to occur during the first and sixth and seventh months of storage. Shrinkage during the first month appears to be due largely to excessive evaporation and high rate of respiration through injured and uncorked surfaces of the tuber, whereas the increase in loss during the last two months occurred simultaneously with excessive sprout growth and increase in temperature. The shrinkage in weight of tubers and the water loss from an atmometer are very similar during the first month and the last two months of storage when the tubers are in an active condition. During the second to fifth months, inclusive, when the tubers are in a resting state, the rate of loss of water from the atmometer is more rapid than the loss from the tubers.

The highest rate of respiration of the tubers was found to occur just after harvest. The rate decreases rapidly even if the tubers are placed at a comparatively high temperature, but again increases with resumption of growth after the dormant period. The greatest rate of respiration occurred in immature tubers harvested in the normal manner, and the least occurred in mature, carefully harvested tubers. The loss in weight due to loss of carbon dioxide in respiration was very small compared with the loss caused by

evaporation of water. Immature tubers lost more weight during the first five months of storage than mature tubers. Indications were that beyond this period mature tubers may lose more weight if they terminate dormancy earlier and sprout more extensively than the immature tubers.

The effect of the temperature at which tubers were held for a short time just after harvesting on the physiological and decay loss of tubers was very marked. Tubers stored from 8 to 12 days at 63° to 68° F. lost considerably less weight and decayed less in subsequent storage than those stored at 39° to 44°. Suberization first made its appearance on the second day and wound periderm on the third day in tubers stored at 68°, whereas suberization was not detected until the sixth day in tubers at the 46° storage, and no periderm layer was noted at the end of 12 days. Such delay in wound healing seemed to offer greater possibilities for loss in weight of injured tubers and increased tuber decay.

Potatoes harvested with a padded digger and picked up in padded containers had much lower shrinkage and decay losses during storage than tubers harvested and handled in the normal manner. Mechanical injuries to tubers also caused greater losses in respiration.

Study of the evaporating power of the air at different levels within a bin of potatoes showed the greatest loss of water from atmometers in the bottom layer and the least from the middle layer, which, however, was exceeded only slightly by the atmometers in the top layer. The smallest shrinkage losses occurred in the tubers of the middle portion of the bin. When the tubers were removed early in the season, before extensive sprouting, the greatest loss occurred in the bottom layer, but in the top layer when tubers were removed late and sprout growth was large. Sprout growth was more extensive in the top layer than in the middle or bottom layers. The evaporating power of the air surrounding the bin exceeded that of the air in any part of the bin when surrounded by potatoes. The average temperature near the floor of the bin for the storage season approximated 5° lower than on top of the bin of potatoes, and the air within the bin averaged 2° to 9.5° higher than the air surrounding the bin. A slightly higher percentage of carbon dioxide was found in the lower layer than in the middle or top layers, due possibly to any or all of greater respiratory activity, inability of gases to escape, or accumulation from layers above due to density of the gas. The analyses indicated that ventilation to replenish the air to increase the oxygen or to decrease the carbon dioxide percentage is unnecessary.

Slightly larger physiological losses in weight of tubers occurred in slatted than in solid-sided bins, while there was no consistent difference in shrinkage of the tubers in insulated and uninsulated cellar rooms.

During three years the greatest physiological loss in weight of potatoes occurred in a house-cellar storage, and the next greatest losses in a barn basement and bank storages, respectively. In most of the storage studies a positive relation was shown between low shrinkage losses of potatoes and high average relative humidity, low average temperature, and low evaporating power of the air surrounding the bin.

Dictionary of sugar terms in 12 languages, R SHEMENESKY (*Lexique des Termes Sucriers en 12 Langues*. [Paris: La Betterave], 1931, pp. 360).—This book gives the French equivalents and vice versa of important laboratory, technological, mechanical, and agricultural terms of the sugar industry for German, English, Spanish, Hungarian, Italian, Dutch, Polish, Portuguese, Russian, Swedish, and Czech; the nomenclature of cane sugar and machinery in Spanish and English; and includes tables of weights and measures, weights of materials, and engineering constants.

Methods of producing sugar-beet seed in southern New Mexico, H. A. ELCOCK and J. C. OVERPECK (*New Mexico Sta. Bul.* 207 (1933), pp. 29, figs. 7).—Practices recommended tentatively for growing sugar beet seed in southern New Mexico, including soil selection, crop sequence, preparation, cultural, irrigation, and harvesting practices—threshing and cleaning, are based on experiments (E.S.R., 65, p. 36) since 1922 in cooperation with the U.S. Department of Agriculture and experience with commercial plantings. Trade requirements for sugar beet seed, seed testing, control of insect pests, undesirable cross-pollination, and the outlook for the industry are also discussed briefly.

Persistence of viability of sweet clover seed in a cultivated soil, T. E. STOA (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 3, pp. 177-181, figs. 3).—Following sweetclover trials at the North Dakota Experiment Station in 1918, in which seed was allowed to mature, volunteer seedlings from seed becoming permeable were more or less in evidence every year including 1932, in spite of the cropping method in each year which resulted in the early destruction of all volunteer sweetclover. The same characteristic preservation of seed was noted on other fields of the station. The sweetclover seed content of soil samples taken in different years was determined. The possibility is suggested that such behavior of sweetclover may be one factor upsetting the uniformity of experimental soil and influencing experimental results.

Distinctive effects of the deficiency of certain essential elements on the growth of tobacco plants in solution cultures, J. E. McMURTREY, JR. (*U.S. Dept. Agr., Tech. Bul.* 340 (1933), pp. 43, pl. 1, figs. 12).—Distinctive deficiency effects of N, P, K, Mg, Ca, B, S, Fe, and Mn on the Connecticut Broadleaf tobacco plant, as produced in a series of nutrient solutions so devised as to permit the withholding of each essential element as desired without changing the quantities of other elements present, are described and illustrated.

Deficiency of nitrogen is shown by the whole plant assuming a light green color, with more or less yellowing and drying or firing of the lower leaves to a light brown color. Shortage of phosphorus produces a dark green plant which may show some yellowing and drying of the lower leaves to a greenish brown. Lack of potassium and magnesium is shown by localized effects, especially chlorosis of the lower leaves. Typical potassium hunger is distinguished from magnesium hunger by the small necrotic spots or specks at the tip and margins of the chlorotic leaves. The chlorotic areas in potassium hunger are yellowish, and with magnesium hunger are pale green or white, with the principal veins tending to retain the green color in both cases.

The deficiencies noted above are general or occur on the older or lower leaves, while those of iron, manganese, sulfur, calcium, and boron show themselves typically on the new growth or bud leaves. Deficiency of iron, manganese, or sulfur produces chlorosis of the younger leaves, each of a characteristic type. Iron chlorosis and manganese chlorosis resemble each other in that the veins tend to retain their green color, but lack of manganese results in a necrotic spotting scattered over the leaf, while no necrotic spots occur with iron deficiency. In chlorosis resulting from sulfur deficiency, the veins are of a lighter green color than the tissue between the veins.

A lack of calcium first becomes apparent as a peculiar hooking downward of the tip of the young leaves of the bud, followed by a breaking down at their tips and margins, which show a cut-out appearance if later growth takes place. Boron shortage is shown in a light green color at the base of the young leaves of the bud, followed by their breakdown which, if not too severe, is followed by later growth, causing the young leaves to become distorted or twisted at their bases. Usually the tip of the leaf remains alive for some time after the base has broken down.

Typical reactions of the roots to the several deficiencies are described, and a key to the deficiency effects studied, based on the contrasts noted, is included.

The possible effect of hydrogen-ion concentration on the absorption of potassium and phosphorus by wheat plants under field conditions, J. DAVIDSON (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 5, pp. 449-453).—Wheat grown on a field plat treated with sodium nitrate at the rate of 600 lb. per acre and on a controlled plat was sampled for analyses at frequent intervals up to maturity. The potassium and phosphorus contents of the entire plant in early growth stages, and of the stalks alone in later stages, showed that potassium was consistently higher in all samplings from the treated plat than in samplings from the control, whereas the reverse was true in the case of phosphorus. The results were considered analogous to those previously reported (E.S.R., 58, p. 213) from water cultures with controlled H-ion concentration, and seemed to be explained by a possible change in the H-ion concentration of the soil caused by the sodium nitrate, a physiologically alkaline fertilizer.

An hypothesis previously advanced explaining the accumulation of cations and anions in growing plants based on the isoelectric relations of the ampholytes of the living cell is discussed further.

Germination of the seed of farm crops in Colorado after storage for various periods of years, D. W. ROBERTSON and A. M. LUTE (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 5, pp. 455-462).—Seed of different cereals adapted to Colorado, stored for varying periods (1920-29) in a dry room at the Colorado Experiment Station, were subjected to annual germination tests.

No connection was evident between the average annual relative humidity and the original germination percentage. Humidities for all years were low. The general trend seemed to indicate that oats, covered barley, and Marquis and Kanred wheat have a high percentage of germination the first year, while Kubanka wheat, Nepal barley (naked), and rye were comparatively low in this respect.

The germination percentage of wheat decreased about 7 percent in 10 years, of barley about 14 percent, and of both midseason and early oats about 13 percent. Two-row and naked barley decreased more than hulled 6-row barley. Rosen rye and Wisconsin Black soybeans decreased 10 percent in germination in 5 years and rapidly thereafter. Black Amber sorghum germinated well for 6 years, decreasing only 2 percent. Yellow dent corn germinated well for the first 4 years, but decreased 13 percent in the fifth year and 20 percent after 8 years of storage.

The microphotography [of the seeds] of cereals and legumes [trans. title], D. STRILCIUC (*Ztschr. Gesam. Getreidew.*, 17 (1930), Nos. 8, pp. 176-181; 9, pp. 194-196, pls. 4; 10, pp. 213, 214, pls. 4; 11, pp. 232-234, pls. 4; 12, pp. 254, 255, pls. 4).—Microphotographs show the cell structure of the principal parts of the mature kernels of the several cereal grains, sorghum, millet, and buckwheat, and of the seed of important legumes usually used for food purposes.

Seed inspection, F. A. McLAUGHLIN and M. E. NAGLE (*Massachusetts Sta. Control Ser. Bul.* 67 (1933), pp. 47).—The germination, purity, and weed seed contents are tabulated for 463 official samples of agricultural seed collected in Massachusetts during the year ended October 1, 1932. Samples of sweet corn, alfalfa, red clover, and sweetclover were also tested for trueness to type, and factors affecting the germination and vigor of garden peas were studied.

Results of seed and legume inoculant inspection for 1932, J. G. FISKE (*New Jersey Stas. Bul.* 550 (1933), pp. 87).—The germination percentage, purity, and other information are tabulated for 1,503 official samples of seed of field crops, vegetables, and lawn mixtures obtained from dealers in New Jersey

in 1932, and the crops, inoculation, number of organisms, and viability are shown for 63 official samples of legume inoculants.

Leafy spurge, life history and habits, H. C. HANSON and V. E. RUDD (*North Dakota Sta. Bul. 266 (1933), pp. 24, figs. 21*).—The distribution, characteristics, life history, and growth habits of leafy spurge (*Euphorbia virgata*) are described in some detail, with brief accounts of studies of dissemination, seed germination, and control.

Leafy spurge, a perennial herb containing latex in all its organs and occurring in fields, pastures, roadsides, and in waste areas, is widely distributed in northern United States and occurs in Canada. Its root system is well developed, going down to an 8-ft. water table in heavy clay soil and with a maximum lateral spread of 3.5 ft. It spreads readily by seeds and roots. Seed germination ranged from 50 to 80 percent in the laboratory and was about 70 percent in the field.

Pieces of roots as small as $\frac{1}{2}$ in. long and about $\frac{1}{8}$ in. in diameter produced new shoots which grew very rapidly. Pieces of roots, 3 in. long by $\frac{1}{4}$ in. in diameter, produced new shoots from at least 6 in. deep. Small or large pieces of the roots withstood up to from 2 to 3 hours of drying in the hot sun before they were killed.

Control experiments indicated that the weed may be killed by sodium chlorate applications, at least from 6 to 8 lb. per square rod being necessary, and also by common salt, or by frequent cultivation during two seasons.

HORTICULTURE

[Horticulture at the Maine Station], J. A. CHUCKA, D. B. LOVEJOY, R. M. BAILEY, I. M. BURGESS, F. B. CHANDLER, I. C. MASON, and C. R. PHIPPS (*Maine Sta. Bul. 363 (1932), pp. 254-264, figs. 4*).—Data are presented on various projects, including a study of the yield of peas and dry vines of the Surprise and Perfection varieties; the results of sweet corn and bean fertilizer and liming tests; the progress of breeding, pollination, and selection studies with apples; small fruit variety tests; variety and strain tests of sweet corn, field beans, and various garden vegetables; and fertilizer, selection, pollination, propagation, and cultural experiments with blueberries.

[Horticulture at the New Hampshire Station] (*New Hampshire Sta. Bul. 270 (1933), pp. 14-19*).—In condensed form reports are given on the results of a study of three different methods of pruning apple trees, on the fertilizer requirements of apples in sod and in cultivation, and the fertilizer needs of the peach, all by G. F. Potter; cold storage of McIntosh, Baldwin, and Cortland apples, including its effect on railroad worm larvae, and scab, by E. J. Rasmussen; the effect of storage delay in reducing brown core; pollination of McIntosh apples, by L. P. Latimer; the influence of phosphorus on fruit bud formation in the apple, by Potter; the use of electrically heated hotbeds, growth of tomatoes in sand, thinning and fertilizer needs of the squash, time of planting cabbage, and variety testing of vegetables, all by J. R. Hepler; and fruit varietal trials and fertilizers for strawberries, both by Latimer.

[Horticultural investigations in Oregon] (*Oregon Sta. [Pamphlet, 1933], pp. 7-9; Branch Sta. [Pamphlets, 1933]—Hood River Sta., pp. 5, 6, 7, figs. 2; Southern Oregon Sta., pp. 2-4, 5-7, figs. 4*).—Brief reports are presented on the results of studies of outstanding significance at the main station in the development of machinery and methods for removing spray residues; small fruit breeding; disease and insect pest control; irrigation of bramble fruits, etc.; at the Hood River Substation on the use of cover crops and irrigation and other factors in orchard management; pollination of pears; and fertilizer requirements of

tree fruits and strawberries; and at the Southern Oregon Substation on pear production problems, including the development of pear stocks; the use of Bordeaux mixture spray in blossom blight prevention; pollination of pears; and control of miscellaneous troubles, such as leaf burn, little leaf, Bosc edema, etc.

The Medford Branch Experiment Station (*Oregon Sta., Medford Branch Sta.* [Pamphlet, 1933], pp. [6], figs. 4).—This leaflet outlines briefly the problems confronting and projects under way at the new branch station established near the city of Medford, Oreg., in the heart of an important pear-producing district, to specialize in pear irrigation.

Relation of hydrophilic colloids to hardiness in cabbage, brussels sprouts, and alfalfa plants as shown by the dye adsorption test, S. DUNN (*Plant Physiol.*, 8 (1933), No. 2, pp. 275-286, figs. 3).—Having suggested in an earlier paper (E.S.R., 64, p. 37) that the dye adsorption test when used alone is not sufficiently consistent to give conclusive readings upon the hardiness of apples, the author herein presents the results of similar trials with other plants grown mostly in the greenhouses of the New Hampshire Experiment Station. Random tests on cabbage plants hardened for varying periods showed, on the average, that hardiness as indicated by the dye adsorption test increased up to 5 days of hardening. In general the results agreed with those of parallel freezing tests. Tests on cabbage and brussels sprouts in which actual frost resistance was first determined showed that where this could be accurately determined there was usually a greater amount of dye adsorbed from solution than in the case of less hardy plants.

Adsorption tests with different dyes varying somewhat in their adsorptive action indicated (1) that pectic substances may be partly responsible for cold resistance, (2) that lignin and allied substances and perhaps proteins are converted during the hardening process, and (3) that constituents of the protoplasm rather than of the cell walls are of primary importance in hardiness.

In the case of alfalfa, dye adsorption of macerated roots was greater in the hardier plants. It is believed that the conflicting results obtained with apple tissue may have been due to the relatively small proportion of vital tissue in relation to the total bulk of the twigs.

Cabbage characters and their heredity, L. R. DETJEN and C. A. McCUE (*Delaware Sta. Bul.* 180 (1933), pp. 147, pls. 16, figs. 4).—In summing up results of long continued breeding experiments discussed from time to time in the annual reports of the station (E.S.R., 66, p. 533), the authors state that cabbage characters pertaining to the plant as a whole or to certain attributes of the head depend frequently on a combination of factors commonly designated as multiple factors. Incompatibility in cabbage is said to be governed in the main by a series of multiple factors which result in a manifestation of very distinct types. Environmental factors, such as temperature, may, however, affect seed setting and temporarily mask the genetic factors. The inheritance of heading, a most important character in cabbage, was studied in various crosses and selfings. Heading plants crossed with headless forms which had been derived from heading varieties produced fully headed plants in the F_1 generation. Heading was likewise found to be governed by a multiple factor for season, which was not allelomorphic to the early factor, although some interference was observed. The type of inflorescence was also based on a multiple factor.

Other characters discussed include color of the leaves, fasciation of stems, length and diameter of stems, length and smoothness of seed pods, savoying of the leaves, etc.

Further evidence that boron is essential for the growth of lettuce, J. S. McHARGUE and R. K. CALFEE (*Plant Physiol.*, 8 (1933), No. 2, pp. 305-313, figs. 8).—In this contribution from the Kentucky Experiment Station there is described a deficiency disease of lettuce resulting from an insufficiency of boron. The first symptoms of deficiency were retarded growth and malformation of the younger leaves, followed by a gradual destruction of the meristematic tissues and the ultimate death of the plant. Small quantities of boric acid, powdered Pyrex glass, and borates of potassium, sodium, calcium, manganese, copper, and zinc were found effective in preventing injury. Plants grown in a boron concentrate of 0.4 p.p.m. were free from leaf injury but produced only a few seeds. Between 0.4 and 0.9 p.p.m. there occurred vigorous growth and normal development, with no evidence of toxicity or boron deficiency. The concentration of 1.2 p.p.m. was decidedly toxic, causing chlorosis and death of the older leaves, and quantities above 2.5 p.p.m. were fatal. Borosilicate was found the most satisfactory compound for incorporation in sand cultures.

Relation of hydrogen-ion concentration to the growth of onions, A. L. WILSON (*New York Cornell Sta. Mem.* 145 (1932), pp. 59, figs. 20).—The optimum H-ion concentration for the growth of onions cultured in nutrient solutions in an acidity range of pH 3.5 to 8 by half degree intervals was determined in three separate experiments conducted under diverse conditions of light, length of day, and temperature. The three experiments failed to show a common optimum value for maximum growth, a result which, from the author's viewpoint, might well be accounted for by the existing environmental differences; for example, the three experiments were initiated on March 12, June 12, and January 4, respectively. The maximum percentage increase in growth was obtained at pH 6.5 to 7, 5.5, and 5.5 to 7, respectively. From the data the author concludes that onions grow well over a pH range of from 5.5 to 7 when other environmental conditions are favorable.

The first injury due to H-ion or OH-ion concentration was observed in the roots. At pH 3.5, 4, 4.5, 5, and 8 subsequent injury occurred in the tops and most of the leaves died. At pH 3.5 all the roots died, and there was much loss of roots at pH 4 and 4.5. Lateral root development was inhibited at high concentrations of both H ions and OH ions. In some cases laterals were killed at about the time they penetrated the epidermis, and in other cases they grew to be from 1 to 2 mm long, when their tips died leaving a cluster of lateral stumps. Although many theories have been formulated to account for the injurious effects of acidity and alkalinity on plants, the author believes the real causes are unknown.

Composition of rhubarb at different stages of maturity in relation to its use in cooking and canning, C. W. CULPEPPER and H. H. MOON (*Jour. Agr. Res.* [U.S.], 46 (1933), No. 5, pp. 387-402, figs. 6).—In this second report (E.S.R., 67, p. 676) on a study conducted at Arlington Experiment Farm, Va., it is stated that total solids were high in very young petioles, decreased while the petioles were elongating most rapidly, increased again during the period of maximum photosynthetic activity, and finally decreased somewhat in the very old material. Titratable acidity did not vary greatly until petioles were old, when a sharp decrease occurred. With both solids and acidity the season of year had a marked effect, the July and October samples being higher in solids and acids than were the spring samples. Sugars and acid hydrolyzable polysaccharides were very low and rather constant. Total nitrogen and amino nitrogen were highest in young leaves, whereas nitrate nitrogen increased with age. Pectin-

like materials, considered largely protopectin, were present in the petioles and apparently had considerable influence on cooking quality.

Packing rhubarb in reenamed, high-grade tins lessened corrosion and improved the flavor as compared with the product stored in plain tin cans. Nitrates, oxalic acid, and malic acid are believed involved in corrosion. If petioles at the proper stage of maturity are selected it is believed that rhubarb may be cooked or canned to advantage at any time during the growing period.

New or noteworthy fruits, XI, G. H. HOWE (*New York State Sta. Bul. 620* (1933), pp. 18, pl. 1).—Briefly summarizing the work of the station in the testing and recommending of new and promising fruits, the author in this, the eleventh of a series (E.S.R., 62, p. 738), discusses and describes the Kendall apple, the Ovid and Willard pears, the Early Rivers and Emperor Francis cherries, the Oriole and Valiant peaches, the Seneca grape, the Naples black raspberry, and the Cato, Clermont, and Culver strawberries. The Kendall apple is shown in color.

Notes on the species of apples.—I, The American crabapples, G. P. VAN ESELTINE (*New York State Sta. Tech. Bul. 208* (1933), pp. 22, figs. 9).—Accompanied by drawings of the dissected flowers, a review is presented of American species and varieties of *Malus*, section *Chloromeles* and subsection *Fuscae* of section *Sorbomalus*. Two new names are offered, namely, subsection *Fuscae* n. subsect. and *M. angustifolia puberula* n. comb. In the case of the eastern American crab apples it is recommended that they be grafted on seedlings of the wild sweet crab or the prairie crab, as the trees live much longer than when on roots of the common cultivated apples. Among varieties derived from *M. ioensis* is the well-known double-flowered ornamental Bechtel crab.

Experiments with commercial nitrogenous fertilizers on apple orchards, J. D. HARLAN and R. C. COLLISON (*New York State Sta. Bul. 623* (1933), pp. 36, fig. 1).—Experiments conducted in six western New York apple orchards, two of Baldwin, two of McIntosh, one of Rome Beauty, and one of Rhode Island Greening, showed that carriers such as nitrate of soda, calcium nitrate, and ammonium sulfate having their nitrogen in readily available form invariably gave good results. Early spring applications produced larger yields than did summer applications, and the application of nitrate of soda after bloom did not result in yields significantly higher or lower than those obtained from early spring applications. The use of nitrogen in the on or heavy blooming year had no significant effect on subsequent yields as compared with those secured from fertilizing annually. Very little evidence was secured that a complete fertilizer containing nitrogen, phosphorus, and potash increased yields above those obtained from the use of nitrogen alone.

With relation to quantity in the early spring applications, 12 lb. of nitrate of soda per each Rhode Island Greening tree increased yields above the 6-lb. treatment. Similar results were secured with McIntosh apples, but decreased color followed the larger applications. In the case of Rome Beauty 7.5 lb. of nitrate of soda or its equivalent in more concentrated materials did not increase yields above those secured with 5 lb.

As to quality of materials the largest and most consistent yields were secured from nitrate of soda, calcium nitrate, and ammonium sulfate. The authors concede, however, that on heavier soils and on those soils containing supplies of organic matter where cultivation or other means of hastening nitrification can be made effective the use of calcium cyanamide, urea, and Calurea should prove satisfactory in producing increased apple yields on healthy trees in well-drained soils.

Progressive changes in the cuticle of apples during growth and storage, K. S. MARKLEY and C. E. SANDO (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 5, pp. 403-412).—Following an earlier study (E.S.R., 65, p. 739) which dealt largely with fruit grown at Arlington Experiment Farm, Va., apples were secured from the Wenatchee Valley, Wash., and from western New York. Conforming with earlier results, it was found that in fruit from both origins the quantities of ursolic acid, oily fraction, and total ether extract present at maturity and at the end of the storage period were greater than those found in the early stage of growth, and that the quantities of these constituents increased from the time of picking to the end of the storage period. With advancing maturity there was generally a progressive increase in the percentage of the oily fraction in the total ether extract.

Using a specially devised method for the quantitative determination of cutin, it was found that this material was more abundant at maturity and at the end of the storage period than in the early stages. Based on averages of mature fruits of several varieties, the ratio of total ether extract to cutin was about 44:56, indicating that the cuticle of apples is composed of approximately 44 percent of ether-soluble constituents and 56 percent of ether-insoluble cutin.

New York fruit in 1929 had higher amounts of ursolic acid, oily fraction, and total ether extract at maturity and at the end of storage than did Wenatchee fruit. Individually the same varieties from the two localities varied somewhat with respect to quantities of constituents. Certain varieties, such as Rome Beauty, Baldwin, and Rhode Island Greening, showed only small variations in the value of ether-soluble constituents with regard to origin, while Grimes Golden, Delicious, and McIntosh varied considerably.

Classification of 135 varieties and species of peaches and nectarines on basis of fruit bud set at New Brunswick, M. A. BLAKE (*New Jersey Stas. Circ.* 274 (1933), pp. 4).—Tabulated data, based on records taken over a period of three years, show that sharp differences exist between varieties with respect to bud set. For example, the Greensboro peach developed a bud set of 29, 29, and 31 fruit buds per 12 in. of twig growth in 1930, 1931, and 1932, as compared with 9, 6, and 8 buds, respectively, for Brackett.

New Jersey standard for classifying the set of fruit buds upon peaches, M. A. BLAKE (*New Jersey Stas. Circ.* 271 (1933), pp. 4, fig. 1).—Stating that the general terms, such as heavy set and light set, are confusing, records were taken on unbranched new growths approximately 12 in. in length at the tips of the stronger side branches 5 to 8 ft. above the ground. Twigs with 40-60, 30-39, 20-29, 15-19, 10-14, and below 10 buds were classified, respectively, as exceptional, unusual, extra good, good, fair, and light. *Prunus kansuensis* alone fell in the exceptional class, and Elberta was in the good class. The author concedes that all classes except the light should provide sufficient buds for a full crop of fruit.

Peach harvesting studies, F. M. COE (*Utah Sta. Bul.* 241 (1933), pp. 60, pl. 1, figs. 14).—Based on four seasons' work with Elberta, Early Elberta, and J. H. Hale peaches obtained from trees of different age, vigor, and cultural treatment, the author concludes that while there are considerable variations in pressure test readings and in ground color under different conditions and in different years these were the most useful and accurate indexes to maturity. Fruit from trees of moderate vigor with good exposure to sunlight was generally ready for picking at a pressure range of 12 to 18 lb. and with a ground color of sulfur yellow or sulfur yellow to amber. In the case of fruit from highly vigorous trees with dense tops the optimum pressure range was from 15 to 18 lb. and the ground color greenish yellow and sulfur yellow. A chart

illustrating the colors is included. Fruit from weakly vegetative trees could be picked over a wider range of pressure readings and colors than was possible in the case of vigorous trees, but it was difficult to secure desirable size.

As regards varieties, J. H. Hale because of its greater firmness could be picked in a somewhat more advanced stage of maturity than Elberta or Early Elberta. There was a significant negative correlation between ground color and pressure tests in both the Elbertas. No consistent differences in firmness, pressure tests, or storage quality was apparent between different sized peaches of the same color and firmness before storage.

In all three varieties red coloration increased markedly in quantity as the picking season was deferred. However, the amount of red in fruits of the same ground color was less in the later pickings. Percentage sugar content increased markedly as harvesting was delayed. In 1932 the increase in total sugars ranged from 16 to 25 percent in 5 days. Size also increased until the fruits were soft ripe.

Gooseberries: Varieties, breeding, culture, and use, A. F. YEAGER and E. LATZKE (*North Dakota Sta. Bul.* 267 (1933), pp. 19, figs. 13).—In crosses between the native wild gooseberry of the Red River country, namely, *Ribes missouriense*, and cultivated varieties, such as Oregon, Houghton, Downing, Red Jacket (Josselyn), and Carrie, those combinations with Oregon as one parent yielded the outstanding results, three of the seedlings, Pixwell, Abundance, and Perry, herein described, being sufficiently valuable for dissemination. Oregon apparently carries a dominant factor for dwarf growth in a heterozygous condition, since two distinct types, dwarf and tall, were obtained from crosses with the wild gooseberry of the Red River Valley.

Supplemental to the breeding results the authors discuss culture, pruning, spraying, and utilization of gooseberries, recipes being presented for jelly, jam, and preserve making.

Raspberry growing in New York State: Cultural practises and disease control, G. L. SLATE and W. H. RANKIN (*New York State Sta. Bul.* 625 (1933), pp. 62, figs. 10).—Based on experimental work at the station and elsewhere, there is presented a general discussion of factors bearing on the maintenance of vigor and the production of satisfactory crops of good quality fruit. Following a discussion of varieties, pruning, culture, harvesting and marketing, etc., considerable attention is devoted to mosaic diseases, their symptoms, effects on growth and yield, use of resistant varieties, means of preventing rapid spread, etc. Other troubles discussed include anthracnose, streak, leaf curl, rust, spur blight, root gall, powdery mildew, and winter injury.

Citrus orchard management in the Lower Rio Grande Valley, W. H. FRIEND (*Texas Sta. Circ.* 67 (1933), pp. 1-40, 49-56, figs. 23).—A general discussion is presented of varieties, species, planning, planting, culture, irrigation, spraying, and other items in the general care of orchards. The various types of diseases occurring in the valley are described, with suggestions for control, and information is given on protecting bearing orchards from the wind and freezes. The storage of citrus fruits is briefly discussed and a calendar of orchard management given. A section on insects is noted on p. 384.

The American rose annual, edited by J. H. McFARLAND and G. A. STEVENS (*Harrisburg, Pa.: Amer. Rose Soc., 1933, pp. 184, pls. 25*).—General information is presented on rose culture and rose varieties. Among the papers included are the following: Rose-Disease Investigations (pp. 87-101), by B. Parsons and L. M. Massey, and Leaf-Shedding and Wilt of Roses (pp. 102-104), by H. R. Rosen.

FORESTRY

Forest education, H. S. GRAVES and C. H. GUISE (*New Haven: Yale Univ. Press; London: Humphrey Milford, Oxford Univ. Press, 1932, pp. XVII+421, figs. 2*).—The results are presented, with discussion, of a study of forest education conducted under the auspices of the Society of American Foresters and supported by a grant from the Carnegie Corporation.

The importance of the origin of seed used in forestry, H. G. CHAMPION (*Indian Forest Rec., 17 (1933), No. 5, pp. VII+76, pls. 12*).—Assembling information from various sources, the author analyzes progress to date, points out promising fields for investigation and the difficulties to be encountered, and discusses experimental technic that should be followed in attaining results.

The effect of different species of tree on the soil [trans. title], V. T. AALTONEN (*Commun. Inst. Forest. Fenniae, No. 17 (1932), [Art.] 5, pp. 88, figs. 24; Eng. abs., pp. 63-67*).—Chemical and physical studies of soils lying beneath pure larch stands, pure pine, and mixtures of pine and spruce showed only comparatively small differences in composition. In the humus layer of the larch plats ammonia was somewhat more abundant, nitrification capacity somewhat weaker, pH generally lower, and the loss on ignition greater than in the soil of the other plats. The mineral soil of the larch stand contained less lime and often more phosphoric acid than did the corresponding soil of the other stands.

The author concludes that chemical properties of soil show considerable variation, irrespective of the forest type, and that substantial differences would be required to influence the forest type. The major result of the study is said to be its demonstration of the difficulty of determining the effect of a given species on the productivity of a locality through examination of the soil.

Effect of soil reaction on the early growth of certain coniferous seedlings, H. L. SUNDLING, A. C. MCINTYRE, and A. L. PATRICK (*Jour. Amer. Soc. Agron., 24 (1932), No. 5, pp. 341-351*).—Observations at the Pennsylvania Experiment Station on the growth and development of roots and tops of white, jack, and red pines and Norway spruce seedlings planted in three different types of soil held at different pH levels by the use of sulfur or slaked lime showed different responses according to the soil and according to the species. In the Morrison sand the optimum acidity for growth and development was between pH 5 and 6, whereas in Wheeling silt loam in which the pH ran naturally from 6.2 to 6.8 the natural alkalinity was apparently deleterious to the seedlings, and improved growth followed the application of sulfur. In the Hagerstown silty clay loam the best seedling growth was obtained with pH values in the vicinity of 7.

As a whole the results were said to indicate that soil acidity either directly or indirectly is an important factor in the growth and development of conifer seedlings.

Some summer-wood percentage relationships in the southern pines, J. E. LODEWICK (*Jour. Agr. Res. [U.S.], 46 (1933), No. 6, pp. 543-556, figs. 9*).—Stating that summer wood, because it has a larger proportion of cell wall substance per unit area of volume than has spring wood, imparts density to timber, the results are presented of a study of approximately 10,000 rings of second-growth longleaf and loblolly pines from Florida, North Carolina, and Virginia.

The general relationships between the two portions of any annual ring and the width of the ring itself held as well for second-growth loblolly as for

second-growth longleaf pine. Preliminary observations on pitch pine and scrub pine showed a similar situation, suggesting that the relationship may hold for all second-growth southern pines.

The maximum percentage of summer wood attained at stump height was approximately that attained at breast height in a stand containing 350 trees per acre. However, the maximum percentage of summer wood attained at a given height in the tree appeared to be independent of the density of stocking. The maximum percentage of summer wood at a given height in the bole occurs only in the narrowest rings in crowded stands, but in more open stands this maximum may be maintained in wider rings. On any cross section the relationship between the percentage of summer wood and the ring width might be expressed by a parabola which is concave downward. Conversely, the relationship between spring wood width and ring width in the same material could be expressed by a parabola concave upward. In the outer rings, beyond the eighth, the relation between the summer wood width and ring width could be expressed by a straight line with a positive slope.

Some aspects of an early expression of dominance in white pine (*Pinus strobus* L.), J. L. DEEN (*Yale Univ. School Forestry Bul.* 36 (1933), pp. VII+34, pls. 2).—Studies in 29 plats located in optimum white pine areas of southern New Hampshire and Vermont indicated that white pine possesses an inherent ability to express dominance, and that such dominance is expressed more favorably on good than on poor quality sites. The standard deviation of diameter at breast height was found a satisfactory criterion of an expression of dominance in stands of like age. Because of a lack of competition, dominance was less noticeable in sparsely stocked stands. In closed stands there was observed a weak expression of dominance, accompanied by a comparatively slow growth of the dominant trees. Thinning operations involving the removal of over-vigorous trees with large branchy crowns tended to reduce the expression of dominance and to make the stand more uniform. Thinning operations designed to favor the stronger trees would, on the other hand, increase the expression of dominance.

Studies in Indiana farm woods.—I, The natural regeneration of farm woods following the exclusion of livestock, R. K. DAY and D. DENUYL (*Indiana Sta. Bul.* 368 (1932), pp. 48, figs. 25).—That the rehabilitation of farm woods is one of the major forestry problems in Indiana is indicated by the fact that more than 80 percent of the total timber area of that State is classified as farm woodland. Continuous grazing, as practiced over most of the region, has gradually destroyed the woodlands by preventing reproduction and in many instances by actually damaging the trees. In many cases because of the extreme environmental changes which have taken place through years of overgrazing, farm woodlands have reached the stage where speedy natural recovery is impossible, due to the limiting factors of tight sod and insufficient overhead canopies.

Four stages, namely, early, transition, open park, and final, in the passing of well-timbered areas to open pasture are discussed, with the statement that the regenerative capacity of grazed woodlands appears to be closely correlated with the stage existing at the time livestock are excluded. In areas which have not passed the early stage natural reproduction may bring about satisfactory regeneration of the existing species. However, when the final stage is reached the tight sod persists for many years, preventing a material establishment of tree species. Woodlands at this stage are deemed beyond a condition of satisfactory regeneration of desirable species by natural means.

Protect hardwood stands from grazing, W. K. WILLIAMS (*U.S. Dept. Agr. Leaflet 86 (1933), pp. 4, figs. 4*).—Stating that the foliage of a number of desirable hardwoods is relished by cattle and that much harm may also arise from their constant trampling of the soil, the author urges the exclusion of livestock from the farm woods if timber production is desired.

DISEASES OF PLANTS

Mycology and plant pathology (5. *Internatl. Bot. Cong., Cambridge, 1930, Rpt. Proc., pp. 346-418*).—Papers on the effect of environment on disease included The Relation of Environment to Disease in Plants, by L. R. Jones; The Effect of Environment on the Development of Seedling Blight in Wheat and Maize and the Nature of Resistance, by J. G. Dickson; Environment and Non-parasitic Disease, by H. G. Lundegårdh; The Infection of Cotton Plants by *Bacterium malvacearum* in Control Chambers, by R. H. Stoughton; Methods in Systematization of the Basidiomycetes [trans. title], by R. Maire; and Mycological Nomenclature, by J. Ramsbottom. Papers on the significance of heterothallism and hybridism in fungi included The Biological Significance of Conjugate Nuclei in the Basidiomycetes, by A. H. R. Buller; Inheritance of the Albinistic Nonconidial Characters in Interspecific Crosses in the Genus *Neurospora*, by B. O. Dodge; The Significance of Heterothallism and Hybridism in Rust Fungi, by J. H. Craigie; Studies on *Coprinus disseminatus* [trans. title], by R. Vandendries; The Changes Induced in the Cytoplasmic Structure of Cells by Virus Diseases, by J. Dufrénoy; The Biological Relationship between Septobasidium and Scale Insects, by J. N. Couch; Some Observations on Entomogenous Fungi, by T. Petch; and Some Phycomycetes [trans. title], by A. Scherffel. Papers on the differentiation and classification of plant viruses included The Differentiation and Classification of Plant Viruses, by J. H. Smith and by J. C. G. Ledingham; The Challenge of Plant Virus Differentiation and Classification, by J. Johnson and I. Hoggan; On the Differentiation and Transmission of Virus Diseases of the Solanaceae, and the Dependence of Their Occurrence and Spread on the Nutrition of the Plants, by E. Schaffnit; and Methods of Identification and Differentiation of Plant Viruses, by H. M. Quanjer. Papers on the action of sulfur as a fungicide included The Nature of the Fungicidal Action of Sulfur, by B. T. P. Barker; Sulfur as a Fungicide, by W. Goodwin; The Influence of the Season of Felling the Trees on the Resistance of the Timber to Wood-Destroying Fungi, by E. A. Gäumann; Studies on the Morphology and Cytology of the Myxobacteriaceae [trans. title], by S. Krzemieniewski; On the Formation of Conidia in Some Phoma-like Fungi, by H. Klebahn; On the Question of Races in Cereal Rust [trans. title], by O. Appel; *Botrytis cinerea* and the Species Problem, by W. B. Brierley; Experiments on the Physiology and Genetics of the Smut Fungi, by S. Dickinson; Investigations on "Mal Secco" of Lemon in Sicily Due to *Deuterophoma tracheiphila* Petri, by G. Savastano and H. S. Fawcett; and The Cultivation of Fungi, by J. Westerdijk. Papers on the dissemination of cereal rusts included The Dissemination of Cereal Rusts, by E. C. Stakman; The Source and Spread of Stem Rust in Western Canada, by J. H. Craigie; and Annual Outbreaks of Rusts on Wheat and Barley in the Plains of India, by K. C. Mehta.

[Plant disease studies by the Maine Station] (*Maine Sta. Bul. 363 (1932), pp. 274-294, 303, 304, figs. 5*).—Data are reported on findings as to potato mosaic and other degeneration diseases, by D. Folsom et al., in part in cooperation with the U.S.D.A. Bureau of Plant Industry (pp. 274-278, 304); rots of potato tubers and seed pieces, by Folsom and R. Bonde (pp. 278, 279); potato spraying and dusting for late blight, by Bonde (pp. 280-284); a home-made

colloidal copper spray, by W. P. Raleigh (pp. 284, 285); potato seed treatment to control *Rhizoctonia*, by Raleigh and Bonde (p. 285); control of apple scab (pp. 285-288) and cucumber diseases (pp. 289, 290), both by Folsom; witches' broom and other blueberry diseases, by F. L. Markin (pp. 291-294); and yield losses from late blight of potatoes and a promising blight-resistant potato, both by Bonde (pp. 303, 304).

[**Plant disease studies by the New Hampshire Station**] (*New Hampshire Sta. Bul.* 270 (1933), pp. 12, 13).—Findings are reported as to potato mosaic and leaf roll, the control of apple scab, the preservation of Burgundy mixture with tartaric and citric acids, and the toxicity of sodium bicarbonate and sodium sulfate in Burgundy mixture.

[**Disease control**] (*New Jersey Stas. Circs.* 278-280, 282-284 (1933), pp. 2 each).—Entitled, respectively, Blossom-End Rot of Tomatoes, Cedar Rust of Apples, Corn Smut, Orange Rust of Blackberry and Raspberry, Cabbage Yellows, and Bacterial Wilt of Sweet Corn, these circulars discuss briefly the nature, cause, and control of the several troubles.

The fungi of India, E. J. BUTLER and G. R. BISBY (*Imp. Council Agr. Res. [India], Sci. Monog.* 1 (1931), pp. XVIII+337, pl. 1).—In the introductory part the authors deal with the history of the fungi in India, their distribution, characters of the fungus flora, etc. A list of the species of fungi of India arranged in systematic order, with notes on many, is then presented, followed by a list of synonyms and other names found to have been applied to Indian fungi (pp. 167-173), a bibliography of 526 titles (pp. 174-209), and a host index (pp. 210-237).

[**Reports of the mycologist, Burma, Mandalay, for the years ended March 31, 1930 and 1931**] (*[Burma Dept. Agr.] Rpt. Mycol.*, 1929-30, pp. 8; 1930-31, pp. 8).—Among the newer diseases observed by D. Rhind during the year ended March 31, 1930, are die-back of coffee, *Pestalotzia palmarum* of coconut, canker and gummosis on sour lime, *Helminthosporium turcicum* and *Phyllachora sorghi* on sorghum, and *Oidium* sp. on sesame, impatiens, and zinnia. The 1931 account, by M. T. Su, deals in some detail with the activity on *Cicer arietinum* of *Rhizoctonia bataticola*; on *Phaseolus lunatus* of *Macrophomina phaseoli* (*R. bataticola*?); on dead cotton of *R. bataticola*; on Piper betle of *Phytophthora colocasiae*; on chilies of *Gloeosporium piperatum*; on *Allium ascalonicum* of *Alternaria* sp.; on *Aleurites fordii* of *Corticium* sp.; and on *Broussonetia papyrifera* of *Fomes lamaoensis* and *F. lignosus* (?).

[**Annual reports of the mycologist for the years 1928-29 and 1929-30**], K. R. MOHENDRA (*Punjab Dept. Agr. Rpts.* 1928-29, pt. 2, I, pp. 79-94; 1929-30, pt. 2, I, pp. 24, pls. 8).—In the first of these reports since the establishment of the position of mycologist beginning August 28, 1928, an account is given of conditions then existing and of subsequent changes and operations, with discussion of diseases of economic plants, and lists of diseases newly recorded in the Punjab plains during the year. The second report contains a corresponding list of diseases newly recorded.

Bacteriophage and its possible relations to the control of plant parasites, B. B. MUNDKUR (*Jour. Indian Bot. Soc.*, 9 (1930), No. 4, pp. 211-217).—A brief inquiry is outlined as to the nature of bacteriophage, its properties, its origin, its relations to bacteria in plants (legume and plant pathogenic bacteria), and the presence of such a lytic principle in connection with the fungi.

The inhibitory action of certain substances on the growth of mould fungi, R. G. FARGHER, L. D. GALLOWAY, and M. E. PROBERT (*Brit. Cotton Indus. Res. Assoc., Shirley Inst. Mem.*, 9 (1930), pp. IV, 37-52).—An outline is given

of the properties required of an antiseptic suitable for general protective use in the cotton industry, with discussion of the results of investigations carried out as to the influences of various substances on the growth of mold fungi on nutrient media in the laboratory. A tabular showing is made as to the results of biological tests on about 160 antiseptics, including inorganic, organomercury, and organic compounds. Several substances were found to possess outstanding toxicity toward mold fungi, prominent among which are salicylanilide, *o*-chloromercuriphenol, *p*-acetoxymercuriacetanilide, thallium carbonate, *p*-nitrophenol, and trichlorophenol. "Of these only salicylanilide ('Shirlan') appears to combine a sufficient number of the desirable properties of an antiseptic for general use in the cotton industry. Solutions of this substance appear to be non-toxic to plant life." The preparation is briefly indicated of substances, uncommon or previously unknown, which have been used in these tests.

The carbon metabolism of *Fusarium oxysporum* on glucose, A. K. ANDERSON, E. L. EVERITT, and P. D. ADAMS (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 5, pp. 473-482, fig. 1).—The main metabolism products of *F. oxysporum* on glucose determined in Pennsylvania Experiment Station studies were carbon dioxide and ethyl alcohol, found in such proportions as to indicate that the organism causes a rather typical alcohol fermentation, resembling *F. lini* (E.S.R., 57, p. 348) in this respect, although *F. oxysporum* made little or no use of ethyl alcohol as a food while *F. lini* very definitely used it.

Experiments with potato cuttings in ethyl alcohol solutions suggested that this product is not responsible for the wilting of potato plants. Cuttings placed in solutions of various strengths became chlorotic and gave off a cantaloup odor. In solutions containing 5 percent and less of alcohol no wilting occurred, whereas there was definite and rapid wilting in 10 percent and stronger alcoholic solutions.

Ophiobolus graminis and *O. herpotrichus* and the diseases they cause in *Triticum vulgare* and other cereals, J. H. J. VAN DE LAAR (*Onderzoekingen over Ophiobolus graminis Sacc. en Ophiobolus herpotrichus (Fr.) Sacc. en over de door Deze Fungi Veroorzaakte Ziekten van Triticum vulgare Vill. en Andere Gramineae. Proefschr., Landb. Hooges., Wageningen, 1931, pp. [8] + 146 + [5], pls. 12, figs. 2*).—This is a Wageningen doctor's thesis.

Cotton diseases [trans. title], A. A. ĬACHEVSKIĬ (*Trudy Prikl. Bot., Genet. i Selekt. (Bul. Appl. Bot., Genet. and Plant-Breeding)*, 24 (1930), No. 5, pp. 294, figs. 25).—In this extensive monograph cotton diseases are dealt with under the chapter headings of historical data (pp. 3-30) and diseases of cotton in various regions (pp. 30-266). Data are presented on such topics as the physiology of the causative organisms, descriptions of varieties, and disease control. References given include about 198 from foreign literature and 20 from the Russian.

The fungi causing mildew in cotton goods, L. D. GALLOWAY (*Brit. Cotton Indus. Res. Assoc., Shirley Inst. Mem.*, 9 (1930), pp. III, 27-36, pl. 1, fig. 1).—An account with summations is given regarding the occurrence and characters of the fungi isolated in pure culture during routine examination of mildew cases, and regarding the difficulties as to classification of forms. Discussion is given on the extent and effects of infection, control methods, and distribution.

Most of the species (about 180) listed belong to the genera *Aspergillus* and *Penicillium*, but species pertaining to *Fusarium* and other forms are frequent. Raw cotton is the principal source of infection. Of the fungi, a comparatively small proportion can cause stains on cloth, and a smaller still can cause tendering of the fabric under the ordinary conditions of exposure.

Control of *Alternaria* blight of ginseng with Bordeaux mixture and injuries accompanying its use, H. A. RUNNELS and J. D. WILSON (*Ohio Sta. Bul.*

522 (1933), pp. 16, figs. 4).—This disease, occurring in commercial gardens and believed to have been present also on plants in their native habitat, rarely kills ginseng but dwarfs the plants seriously and thereby reduces yields. Over a period of 5 years various materials, such as Bordeaux mixture, colloidal copper, colloidal sulfur, and monohydrated copper-hydrated lime dust, were tested for the control of *Alternaria* blight, with the observation that none of the sprays containing copper or sulfur were effective, with the exception of Bordeaux mixture and Pyrox. Bordeaux mixture 3-4.5-50 used alone gave very satisfactory control in 3 of 4 years in which tested. The addition of soap made the spray easier to apply but had no material benefit in control. Since the addition of calcium arsenate increased the effectiveness of Bordeaux mixture, it is suggested that 1 lb. of potash fish-oil soap and 1 lb. of calcium arsenate be added to each 50 gal. of the Bordeaux spray.

Bordeaux mixture was found capable of causing injury to ginseng if improperly made, if applied during freezing weather, and if applied during periods of drought. The critical soil moisture range with relation to Bordeaux mixture leaf injury was in the summer of 1931 between 12 and 17.5 percent, computed on the basis of the dry weight of the soil; hence if irrigation is unavailable it is recommended that spraying be postponed until sufficient rains have fallen to wet the soil thoroughly.

The downy mildew of the hop in 1929, E. S. SALMON and W. M. WARE (*Jour. Inst. Brewing*, 36 (1930), No. 2, pp. 63-67).—Listing accounts regarding hop downy mildew (*Pseudoperonospora humuli*) since its alleged first appearance (1924) in England, some of which have been noted (E.S.R., 68, p. 55), the authors indicate the main features of the hop downy mildew attack on the bines of 1929, said to be almost as severe as that of 1928. The facts cited tend to show that the majority of spikes either arise from infected buds or they become infected by zoospores as they are developed in the early spring. In the south of England downy mildew remained quiescent during the hot, dry summer, though it was clear that sufficient infection existed to enable the disease to become dominant, perhaps to the extent of destroying the cones if wet weather had occurred. The varieties affected included Early Bird, Bramling, Goldings, Stumps, and Tolhurst. Fuggles was indicated by one grower as quite free from attack.

"The experience of the last five years shows clearly that considerable risk is taken if hop gardens are not sprayed to protect the foliage from infection, since it is on this that spores are formed during the summer months." An improved sprayer is described as securing a very efficient wetting of the "heads", with good results. Homemade Bordeaux mixture at 1 percent has proved to be easily made on the farm and entirely safe for use on hops until the cones approach ripeness, when the need arises for another fungicide for the nearly-ripe cones. The discovery that the zoospores are killed in solutions containing over 0.1 percent of soft soap may prove to be of practical value.

Substances toxic to the downy mildew of the hop, W. NEWTON and C. YARWOOD (*Jour. Inst. Brewing*, 36 (1930), No. 2, pp. 67, 68).—Sap bleeding from cut tips of hop plants was found to be toxic to zoospores of the downy mildew organism, *Pseudoperonospora humuli*, but sap from the cut bases of the stems was practically nontoxic, as was also that expressed from ground-up material of hop and other plants. Commercial pine resin dissolved in methyl alcohol and potassium hydroxide was more toxic to the zoospores than was copper sulfate.

Rhabditis lambdiensis, a nematode possibly acting as a disease agent in mushroom beds, G. STEINER (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 5, pp. 427-435, figs. 4).—A detailed description is presented of a nematode believed to be a probable carrier and distributor of a pathogenic agent (*Bacterium tolaasi*)

causing a black-spot or brown-spot disease of mushrooms. Since nematodes travel readily on moist surfaces and since mushroom beds must be sprinkled regularly, the author concedes that an ideal opportunity is provided for the nematodes to spread rapidly, carrying with it either externally or internally the pathogenic bacterium.

Abnormal enlargement of peas from plants affected with root-rot, J. G. HORSFALL and Z. I. KERTESZ (*New York State Sta. Bul.* 621 (1933), pp. 20, figs. 6).—Observations in 1931 and 1932 upon the comparative size of peas harvested from healthy and from diseased plants showed that as long as a plentiful supply of water was present in the soil diseased peas grew larger and remained larger than did peas on healthy vines, even if they were of equal age, as determined by the number of days from blossoming. However, when the soil moisture fell below a point where the diseased roots could absorb water easily the peas on the diseased vines shriveled and became smaller than those on healthy plants. If shriveling had not progressed too far subsequent rains caused some reenlargement of the peas.

The authors believe that the abnormal enlargement of peas on diseased vines may be correlated with a more rapid growth of the seeds at the expense of the vines. That earlier blooming was not a factor was shown in observations on tagged blooms. Blooming rates were somewhat slower for plants affected with root rot, although the growth rate was undoubtedly faster.

Peas, both healthy and diseased, derived in 1932 from late blooms grew more slowly but attained a larger size than did the comparable product of early blooms. Here again, however, peas on diseased plants grew the more rapidly. The authors suggest that root rot may offer a partial explanation of why it is sometimes difficult to obtain good quality, large size peas.

The control of apple diseases in Quebec in relation to cultural methods, H. N. RACICOT (*Quebec Soc. Protect. Plants Ann. Rpt.*, 22 (1929–30), pp. 49, 50).—In Quebec the apple-growing districts are not far from the northern limits of growing apples for profit. There are fewer parasitic diseases and more disorders due to climatic and related conditions followed by secondarily or weakly parasitic diseases. Winterkilling or injury results from imperfect maturing of newly formed wood, also from use of fertilizers prolonging growth, a result which also follows too close pruning. Winter injury with resultant weakening is followed by such diseases as black rot canker, silver-leaf, and collar rot. Appropriate treatment and orchard practices are outlined.

Further studies of the brown rot fungi.—IV, *Sclerotinia fructigena* as the cause of an apple canker, H. WORMALD (*Brit. Mycol. Soc. Trans.*, 15 (1930), pt. 1–2, pp. 102–107, pl. 1).—In continuation of accounts previously noted (*E.S.R.*, 65, p. 540), a description is given of a severe infection of Melon apple trees due to *S. fructigena*. The infection extended back from the fruit via the spurs to the branches, causing branch cankers, which girdled the branches and killed the parts beyond. Monilia pustules appeared in August, ceasing to function on the approach of winter but showing new pustules the following June. Brief reference is made to similar infection on four other apple varieties.

The fire blight problem, J. E. MACHACEK (*Quebec Soc. Protect. Plants Ann. Rpt.*, 22 (1929–30), pp. 56–67).—Fire blight, recently serious on pomaceous and especially on stone fruits, particularly in southern Quebec, is said to be native in North America, attacking cultivated and wild hosts, including pear, apple, quince, wild and cultivated crab apples, service berry, hawthorn, California holly, mountain-ash, apricot, yakimine, cheney plums, prunes, cherries, loquat, strawberries, and in one supposed case Lombardy poplar. It was causing loss in Japan in 1911, was epidemic in New Zealand in 1919, and was present in

Italy in 1925. An account is given as to the symptoms, pathologic anatomy, host relationships and varietal susceptibility, mode of infection, and control, including formulas for a mercury-glycerin disinfectant and for a Bordeaux (dust) oil paint.

Observations on the ascospore discharge of *Venturia inaequalis* in relation to certain environmental factors, G. C. CHAMBERLAIN (*Quebec Soc. Protect. Plants Ann. Rpt.*, 22 (1929-30), pp. 68-78, figs. 3).—During seven years of spray experiments to control apple scab observations were made as to periods of ascospore discharge, and these are here recorded along with temperature and precipitation records as there appears to be a striking correlation over a period of years between these two environmental factors and ascospore discharge. The data were secured from overwintered leaves of the McIntosh variety showing abundant production of perithecia. A tabular exposition is presented. Ascospore discharge shows no direct correlation with host development, and the records here presented are held to indicate the advisability of basing spray schedules on ascospore discharge and precipitation data and not on host development alone.

Control of apple scab in the Quebec region, O. CARON (*Quebec Soc. Protect. Plants Ann. Rpt.*, 22 (1929-30), pp. 47, 48).—The result of organized attempts at apple scab control in the parishes of St. Nicholas and St. Etienne was that whereas the estimate of the quality of the apple harvest gave for 1928 of choice apples 5 percent, salable 50 percent, and culls 45 percent, that of 1929 gave figures of 60, 25, and 15 percent, respectively, though an important spray was omitted in the latter year.

Evaluation of applications of lime-sulfur for the control of apple scab, W. O. GLOYER (*New York State Sta. Bul.* 624 (1933), pp. 39, figs. 7).—Working with Ben Davis trees planted on the station grounds in 1916, it was found in studies extending over a 3-year period that lime-sulfur spray was most effective in the control of scab when the time of application coincided with the vulnerable stages of the scab organism. However, a single application that occupied a strategic position in the spray program in one year might prove of little value another season. Apparently lime-sulfur spray may be eradivative as well as protective. In the three years the single delayed dormant, the preblossom, the calyx, and the first cover spray exerted eradivative functions. For example, the single delayed dormant spray of 1932, applied prior to the first rain period so as to inhibit primary infection, showed only 15 percent scabby fruits at harvest as compared with 50 per cent. for a single protective application.

The so-called Geneva or double stairlike system of application, providing an increasing and a decreasing series, was used in the study so that single, deferred, and various sequences of sprays could be compared. Lime-sulfur used as a summer spray injured both fruit and foliage in two of the three years. Leaf counts in July sometimes showed trees with heavy foliage infection but with no scabby fruits.

In concluding, the author points out that modifications of spray programs on the basis of scab development can be made only after similar testing of other varieties and in various fruit-growing districts.

Cranberry false blossom, C. S. BECKWITH (*New Jersey Stas. Circ.* 275 (1933), pp. 4, figs. 4).—Transmitted from vine to vine by the blunt-nosed leaf-hopper, the control of cranberry false blossom disease is said to lie primarily in the elimination of the insect by spraying with pyrethrum solutions or by flooding the bogs with water. However, it is pointed out that neither of these measures will eradicate the disease but simply serve to stop its spread, and incidentally to increase the crop considerably.

False blossom inoculation experiments at Toms River, New Jersey, 1928 and 1929, R. B. WILCOX (*Amer. Cranberry Growers' Assoc. Proc. Ann. Meeting*, 60 (1930), pp. 11-16).—"This experiment showed impressively the ease with which false blossom infection can be secured."

Raspberry diseases and their control in Quebec, H. N. RACICOT (*Quebec Soc. Protect. Plants Ann. Rpt.*, 22 (1929-30), pp. 51-54).—Raspberry diseases of present economic importance in Quebec, including mosaic, leaf curl, spur blight, and anthracnose, are dealt with from the standpoint of ready recognition and economical control.

The Phytophthora disease of the calla in America, K. S. CHESTER (*Jour. Arnold Arboretum*, 11 (1930), No. 3, pp. 169-171).—In 1930, the author studied a diseased condition of the calla lily (*Zantedeschia (Richardia) aethiopica*) in a greenhouse in Marthas Vineyard, Mass. The plants were imperfect in various ways described, and examination indicated the effects of attack by a *Phytophthora* supposedly identical with the European disease caused by *P. richardiae*. The calla lily disease is said to have been first observed by Buisman in the few years just prior to 1927 (*E.S.R.*, 61, p. 46; 64, p. 152). The formalin treatment essentially as approved by her and as herein outlined was found satisfactory.

Graft-blight of lilac, K. S. CHESTER (*Jour. Arnold Arboretum*, 11 (1930), No. 4, pp. 232, 233).—A disease of lilac (*Syringa vulgaris*), studied by the author since 1928 and named by him graft blight, was observed in nurseries in New England, New York, and New Jersey, also in private plantings, and has also been reported in Oregon, Ontario, and Germany. The plants affected exhibit symptoms of general nutritional deficiency, which are described. Few plants recover.

Although supposedly abiotic as to character and causation, the disease showed no consistent relation to external environment. It was limited, however, to lilacs grafted or budded onto privet stocks, varying with the privet species used, none of which appeared satisfactory. Incompatibility is supposed to exist between lilac scions and privet stocks, and it is supposed that stocks from other members of the Oleaceae are objectionable for the grafting of *S. vulgaris*.

Graft-blight: A disease of lilac related to the employment of certain understocks in propagation, K. S. CHESTER (*Jour. Arnold Arboretum*, 12 (1931), No. 2, pp. 79-146, pls. 4, figs. 7).—This extended paper describes more particularly the disease above noted. "The use of privet (*Ligustrum* sp.) as a grafting understock is demonstrated to be the cause of the symptoms indicated". The symptoms correlating precisely with the use of certain privet species in propagation.

The chief undesirable factor is considered to be a discrepancy in the growth vigor of the two graft symbionts which is caused or aided by the interruption of the elaborated substances in their passage from crown to root system, though other physiological factors are supposedly involved.

Recommendations made include abolishment of the use of lilac as understock, the abolishment or modification of the use of privet in this capacity, and the furtherance of use of own-root methods.

Life-history studies of the species of Phomopsis occurring on conifers, Part I, G. G. HAHN (*Brit. Mycol. Soc. Trans.*, 15 (1930), pt. 1-2, pp. 32-93, pls. 3, figs. 29).—As the result of an investigation of the known species of *Phomopsis* on conifers undertaken to differentiate *P. pseudotsugae*, the cause of the so-called *Phomopsis* disease of Douglas fir, from closely allied forms occurring on this and other conifer hosts, the present status of *Phomopsis*, now regarded as the imperfect stage of *Diaporthe*, is discussed. On the basis of a broad conception of the genus, certain atypical forms whose perfect stages are still

unknown are included in the *Phomopsis* group. These forms approach the form genus *Fusicoccum*, although they show a greater affiliation with *Phomopsis*. The eight species differentiated include *P. occulta* (*D. conorum*), *P. juniperovora*, *P. conorum*, *P. montanensis* n.sp., *P. strobil*, *P. pseudotsugae*, *P. abietina*, and *P. boycei* n.sp. The conifer *Phomopsis* spp. exhibited great constancy as regards culture growth characters, of which those shown on a single medium are described for the group.

The conifer *Phomopsis* spp. showed both wide and extremely limited host relationships, as discussed.

Three species of Botryodiplodia (Sacc.) on elm trees in the United States, C. BUISMAN (*Jour. Arnold Arboretum*, 12 (1931), No. 4, pp. 289-296, pls. 2, fig. 1).—In studies of European elm disease, the author isolated fungi from cankers on elm trees showing die-back: *B. malorum* and *B. ulmicola* in case of *Ulmus americana* and *B. hypodermya* in that of *U. foliacea suberosa*. These when studied in natural cankers and in monosporic cultures produced two types of spores, one-celled and two-celled. *B. ulmicola*, said to have been hitherto included under *B. hypodermya*, has been separated as a distinct species.

Elm saplings were inoculated in the greenhouse with spores from each of the three species of *Botryodiplodia*, the spores germinating and an infection resulting in each case. The mycelia of *B. malorum* and *B. ulmicola* persisted in a living condition but caused no cankers, the mycelium of *B. hypodermya* invading adjacent tissues and causing typical cankers.

Brown bast: Some considerations as to its nature, E. RHODES (*Rubber Res. Inst. Malaya, Quart. Jour.*, 2 (1930), No. 1, pp. 1-11, pls. 4).—Brown bast disease is said to be best considered as a phenomenon closely related to the tree reaction of wound healing and obeying the same general laws. A pathological condition, occasionally occurring in a few vessels after tapping, is followed by the deposition of wound gum and the formation of burrs. The wound-gum deposition is said to be essentially a process carried out by enzymes normal to the tree and closely linked with its state of vigor.

This linking of the disease with enzyme activity and tree vigor enables a simple explanation of several obscure but fundamental points connected with its incidence. A new light is also thrown upon the relation between brown bast trees and so-called dry trees in small holdings.

Some observations of the mildew leaf disease of Hevea brasiliensis due to Oidium hevea, A. R. SANDERSON (*Rubber Res. Inst. Malaya, Quart. Jour.*, 2 (1930), No. 1, pp. 16-30).—It is said to have been definitely established that *Oidium* leaf disease is present throughout the rubber-growing areas of the eastern Tropics (except south India and Burma), and that it overwinters there and tends to increase year by year. The repeated defoliations occurring each season are thought to affect adversely both the yield and the vigor of the tree.

Original infection and rapid local spread are favored by dry-weather conditions during the winter period. Control is easily secured through the use of sulfur spray or dust, though repeated applications are needed in the winter season at short intervals. The attack occurs at all ages, including the nursery period, and is supposedly due to wind dispersal of the spores (conidia), which are produced more abundantly during the dry weather characterizing a normal winter season when the leaves are presumably most susceptible.

Pecan rosette: Soil, chemical, and physiological studies, A. H. FINCH and A. F. KINNISON (*Arizona Sta. Tech. Bul.* 47 (1933), pp. 407-442, figs. 12).—Stating that rosette has caused the abandonment of pecan orchards in certain valleys of Arizona, the authors present the results of studies upon the nature

and control of this trouble. Studies of the soluble salt content of soil samples collected by horizons showed no clear relationship between salts and the occurrence of rosette, although the trouble was common on soils containing a high salt content. Severe rosette occurred where the black alkali content ranged from 0 to more than 204 p.p.m., but in the areas studied healthy trees were never found on soils containing more than 12 p.p.m.

Of various chemicals, including compounds of iron, magnesium, manganese, zinc, potassium, phosphorus, and sulfur inserted in a dry condition or in solution in the trunks, the zinc salts were outstanding in their beneficial effects. In severely rosetted trees following introduction of zinc into the trunk, dying back of the shoots was arrested, and in from 3 to 6 days the new unfolding leaves of lateral buds became definitely greener. Dipping or spraying of young diseased leaves with solutions of zinc was followed by improvement, suggesting perhaps that the zinc applications could be made as part of the spray program. Analyses of diseased leaves and shoots showed them to contain less zinc than did healthy material. The roots of diseased trees apparently were unaffected. Irrigation waters of certain districts where rosette was not common contained zinc, whereas in districts where rosette was prevalent the irrigation waters contained no zinc.

Investigations on the spike-disease of sandal, I-V, edited by V. SUBRAHMANYAN (*Bangalore: Indian Inst. Sci.*, 1931, pts. 1-2, pp. 16; 3, pp. [2]+20; 1932, pts. 4, pp. [2]+16; 5, pp. [2]+18, figs. 2).—Part 1 includes a condensed statement of the more important observations recorded before April 1, 1931, in connection with the spike disease of sandal. Parts 2 to 5 give reports of the progress made during the quarter ended, respectively, June 30, September 30, and December 31, 1931; and March 31, 1932.

The spread and the control of Phacidium blight in spruce plantations, J. H. FAULL (*Jour. Arnold Arboretum*, 11 (1930), No. 3, pp. 136-147).—Though the spread on spruce in the nursery of blight due to *P. infestans* is rapid if not checked, the fungus was fully controlled in seed beds and in transplant lines by spraying with lime-sulfur late in the fall, and it is believed that this is also practicable in plantations. The blight supposedly spreads from infected to healthy masses of foliage, and neither age nor orientation functions, apparently, in connection with this extension of the disease so long as the air temperature in the snow pockets is sufficiently high. The spread is said to occur largely under the snow melting in the spring. The data are given in tabular form.

The effect of concentration on the toxicity of chemicals to living organisms, E. BATEMAN (*U.S. Dept. Agr., Tech. Bul.* 346 (1933), pp. 54, figs. 31).—Using a strain of the wood-destroying fungus *Fomes annosus*, highly resistant to the toxic action of chemicals and normally producing an easily measured growth in cultures, the author found that under like conditions radial growth of the fungus is directly proportional to the time of growth. There was noted a definite relationship between the concentration and the percentage retardation of fungus growth on nutrient agar containing various chemicals. It was possible to designate this relationship by the general equation $R=DC^n$, in which R is the percentage retardation, C the concentration, n a constant or exponent which seems to be a function of the chemical structure, and D a constant which apparently depends on the individual compound. The exponent n has one value if the poison is an inorganic salt with a poisonous basic radical, another value if an ortho substituted benzene derivative, and still another value if a para or meta substituted benzene derivative. The concept that toxic action may be expressed as a parabolic function of the concentration appeared applicable, within limits, to other organisms, such as aphids, bacteria, and green plants.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Economic mammalogy, J. HENDERSON and E. L. CRAIG (*Springfield, Ill.: Charles C. Thomas, 1932, pp. X+397*).—The first part of this work (pp. 1-184) is devoted to a general discussion presented in 28 sections. The systematic account presented in part 2 (pp. 185-347) is followed by a bibliography (pp. 348-373) and a general index (pp. 375-397).

In days agone: Notes on the fauna and flora of subtropical Florida in the days when most of its area was a primeval wilderness, W. S. BLATCHLEY (*Indianapolis, Ind.: Nature Pub. Co., 1932, pp. 338, pls. 15*).—This further volume (E.S.R., 68, p. 63) on the plant and animal life of Florida reports observations made during the course of six trips between 1911 and 1922 into extreme southern Florida. The occurrence, habits, and value of animals, including birds, mammals, reptiles, batrachians, arthropods, etc., and particularly coleopterous and heteropterous insects are recorded, with generic and in most cases their specific names.

Foods of some predatory fur-bearing animals in Michigan, N. DEARBORN (*Mich. Univ., School Forestry and Conserv. Bul. 1 (1932), pp. 52, pls. 4, figs. 32*).—This account summarizes the findings of a 2-year investigation of the food habits of the principal predatory fur-bearing animals in Michigan, including the opossum, raccoon, red fox, coyote, wild cat, mink, New York weasel, skunk, and badger.

Hints on mountain-lion trapping, S. P. YOUNG (*U.S. Dept. Agr. Leaflet 94 (1933), pp. 8, figs. 5*).—This leaflet, based on the experience of predatory-animal hunters of the Bureau of Biological Survey, has been prepared with a view to aiding stockmen and game protectors in local control of mountain lions.

The rodents of France and the combat of injurious forms [trans. title], A. CHAPPELLIER (*Arch. Hist. Nat. Soc. Natl. Acclim. France, 9 (1932) pp. 139, pls. 6, figs. 49*).—Following a brief introductory part the rodents of France are dealt with in systematic order (pp. 19-80). Control measures for rodent pests are then considered (pp. 81-119), followed by a review of legislative and regulatory control measures (pp. 120-138).

The bird: Anatomy, physiology, appearance, and adaptation, I. F. GROEBBELS (*Der Vogel: Bau, Funktion, Lebenserscheinung, Einpassung. Berlin: Borntraeger Bros., 1932, vol. 1, pp. XII+918, pls. 2, figs. 234*).—This first volume is devoted to (1) the respiratory system, with a 15-page classified list of references (pp. 13-256), and (2) the alimentary system, with a 49-page classified list of references (pp. 257-895). Indexes are included (pp. 896-918).

The birds of Newfoundland Labrador, O. L. AUSTIN, JR. (*Mem. Nuttall Ornithol. Club, No. 7 (1932), pp. [2]+229, pl. 1, figs. 2*).—Following the introductory part, which deals largely with ornithological explorations in Newfoundland Labrador (pp. 1-12), the origin and history of the Labrador avifauna is dealt with (pp. 13-22). Then follows an annotated list of the birds of Newfoundland Labrador (pp. 23-201), a bibliography (pp. 203-219), and a subject index (pp. 221-229).

Abundance and conservation of the bob-white in Ohio, S. C. KENDEIGH (*Ohio Jour. Sci., 33 (1933), No. 1, pp. 1-18, figs. 2*).—The author concludes that the population of bobwhites in Ohio is not of sufficient size to permit of a general open hunting season throughout the State.

Woodpeckers, friends of our forests, T. G. PEARSON (*Natl. Geogr. Mag., 63 (1933), No. 4, pp. 453-479, pls. 8, figs. 10*).—This is the fourth of a comprehensive series of paintings and descriptions of the important families of birds of North America (E.S.R., 68, p. 777).

The meaning of bird control, W. L. MCATEE (*Wilson Bul.*, 45 (1933), No. 1, pp. 3-9).—A discussion contributed from the U.S.D.A. Bureau of Biological Survey.

Forest plantations injured by roosting birds, G. R. STEWART (*Jour. Forestry*, 31 (1933), No. 4, pp. 421-423, fig. 1).—The author reports upon black-birds, starlings, and other gregarious birds roosting in large numbers in pine plantations as the cause of defoliation and death of the immediate trees. Examination of the soil indicates only one essential alteration—the droppings raised the nitrate nitrogen under the dying trees to excessive and toxic proportions.

Notes on the poisonous secretions of twelve species of toads, K. K. and A. L. CHEN (*Jour. Pharmacol. and Expt. Ther.*, 47 (1933), No. 3, pp. 281-293, fig. 1).—This account of 12 species of *Bufo* is presented in connection with a list of 22 references to the literature.

The effects of dehydration upon the hatchability of *Limax flavus* eggs, E. B. CARMICHAEL and T. D. RIVERS (*Ecology*, 13 (1932), No. 4, pp. 375-380).—It was found that fully developed embryos of the slug *L. flavus* L. could suffer a loss of from 35 to 40 percent of their weight and still survive.

The influence of helminth parasitism on the abundance of the snowshoe rabbit in western Canada, R. V. BOUGHTON (*Canad. Jour. Res.*, 7 (1932), No. 5, pp. 524-547, pl. 1, figs. 12).—The author reports upon the results of "a survey of the helminth parasites of 420 rabbits (*Lepus americanus*) from the Province of Manitoba. The survey yielded three species of Cestoda, two larval and one adult form, five species of Nematoda, two of which are regarded as new to science, an unidentified acanthocephalan, and several species of the protozoan genus *Eimeria*. No Trematoda were found. The biology and pathogenicity of the helminth parasites suggest that the three most dangerous parasites to the health of the rabbit population are *Nematodirus triangularis*, *Synthetocaulus leporis*, and *Eimeria* sp. A definite correlation between the percentage of rabbits infested by parasites and the meteorological conditions in the different soil areas of the Province appears to exist."

Faunae of nests of the magpie and crow in western Montana, W. L. JELLISON and C. B. PHILIP (*Canad. Ent.*, 65 (1933), No. 2, pp. 26-31).—Extremely heavy infestations of *Protocalliphora avium* Shan. and Dobr. are recorded from nests of magpies, 373 larvae having been taken from one nest containing 4 fledglings. Forty-seven larvae were found in the nest of a crow. Two hymenopterous parasites, *Marmoniella vitripennis* (Walk.) and *Morodora armata* (see page 398), were reared from puparia collected. A total of 16 species of insects and arachnids are recorded from crow and magpie nests in western Montana.

The Zooecidia of plants in South and Central America, C. HOUARD (*Les Zooécidies des Plantes de l'Amérique du Sud et de l'Amérique Centrale*. Paris: Libr. Sci. Hermann & Co., 1933, pp. 519, figs. 1028).—This, the sixth of a series of publications dealing with the animal galls of plants, three of which relating to the insect and other animal galls of plants in the Mediterranean Basin of Europe have been noted (E.S.R., 30, p. 852), is the first to deal with the American forms. The work includes descriptions and illustrations of the galls, references to their original description, their geographic distribution, a bibliography of 38 pages, and zoological and botanical indexes.

Insect behaviour, E. CHEESMAN (*London: Philip Allan*, 1932, pp. VII+189, figs. 6).—A popular presentation of the subject.

The effect of climatic conditions upon populations of insects, P. A. BUXTON (*Roy. Soc. Trop. Med. and Hyg. Trans.*, 26 (1933), No. 4, pp. 325-356, figs. 5).—This contribution is accompanied by a list of 63 references to the literature.

The influence of temperature on the life-history of insects, E. JANISCH (*Ent. Soc. London, Trans.*, 80 (1932), pt. 2, pp. 137-168, figs. 9).—This contribution deals with the subject under the headings of length of development and temperature, the course of development, mortality, range of variation, and general conclusions, presented in connection with a list of 15 references to the literature.

The evolution of the respiratory function of the blood, A. C. REDFIELD (*Quart. Rev. Biol.*, 8 (1933), No. 1, pp. 31-57, figs. 6).—This subject is presented in connection with a list of 87 references to the literature.

The progression factor in insect growth, F. S. BODENHEIMER (*Quart. Rev. Biol.*, 8 (1933), No. 1, pp. 92-95).—"Insect growth follows a progression factor of 2 or n^2 for weight, and of $\sqrt[3]{2} = 1.26$ or $n \cdot 1.26$ for length. The increase of latent divisions in the Holometabola obscures these relations, without invalidating them."

The migrations of insects [trans. title], G. FRAENKEL (In *Ergebnisse der Biologie*. Berlin: Julius Springer, 1932, vol. 9, pp. 1-238, figs. 36).—This account is presented in connection with a 26-page classified list of references to the literature.

Insect coloration and the relative acceptability of insects to birds, F. M. JONES (*Ent. Soc. London, Trans.*, 80 (1932), pt. 2, pp. 345-386, pls. 11).—This is a report of a series of experiments conducted on the island of Marthas Vineyard, Mass., during the summers of 1930 and 1931. The details are presented in tabular form, and one of the several plates, which is in colors, illustrates the insects refused or accepted by ants.

Fighting the insects: The story of an entomologist, L. O. HOWARD (*New York: Macmillan Co.*, 1933, pp. XVII+333).—This account furnishes much historical information in the field of economic entomology, which supplements the earlier contributions (E.S.R., 64, pp. 601, 648; 66, p. 447).

Insecticides of plant source, I [trans. title], I. HOUBEN (*Anz. Schädlingssk.*, 8 (1932), No. 7, pp. 83-88).—This first contribution, from the chemical laboratory of the Royal Biological Institution at Dahlem, near Berlin, consists of a review of the literature on derris, more than 75 references to which are included.

The analysis of derris roots and the estimation of the rotenone content, D. R. KOOLHAAS (*Bul. Jard. Bot. Buitenzorg*, 3 ser., 12 (1932), No. 3-4, pp. 563-574, fig. 1).—The author has found the rotenone content of derris root to show wide variation not only when the different varieties are mutually compared but also when different plants of one variety are compared. The rotenone content does not always show a maximum for derris roots at the age of 23-24 months. The rotenone content is lower for very fine roots than for more coarse roots, the rotenone being principally located in the wood. There is said to be no relation between the rotenone content and the ether extract. Three derris roots were found with an extremely high rotenone content, namely, 12, 10.6 and 10.6 percent, respectively.

Rotenone: Its insecticidal value, J. M. GINSBURG (*New Jersey Stas. Circ.* 273 (1933), pp. 2).—A brief practical statement.

Pyrethrum: Its value in exterminating insects, J. M. GINSBURG (*New Jersey Stas. Circ.* 272 (1933), pp. 4).—A practical summary of information.

The preparation and properties of pentathionic acid and its salts: Its toxicity to fungi, bacteria, and insects, O. N. LIMING (*Phytopathology*, 23 (1933), No. 2, pp. 155-174, fig. 1).—In tests of the value of pentathionic acid as an insecticide, three common species of plant lice, the bean aphid, the cotton or melon aphid, and the spiraea aphid (*Aphis spiraeicola* Patch), were used. The results of the preliminary tests indicate that this acid is very toxic to plant

lice, or about one third as toxic as nicotine sulfate to the melon aphid and equal to the nicotine spray in the control of *A. spiraeicola*.

In preliminary tests made by H. F. Dietz, a 0.5 percent solution of the acid was capable of killing earthworms in one hour, it comparing favorably with pyrethrum in the time required.

Oil spray investigations (*Oregon Sta., Hood River Branch Sta.* [*Pamphlet, 1933*], p. 6).—In a brief summary of results obtained at the Hood River Substation during the past decade, it is pointed out that in dormant applications certain oil sprays were found unsafe during the critical period of bud development while others are safe but not quite so efficient. In summer sprays oils were found to be of questionable adaptability. Newtown apples were found to be highly susceptible to oil injury. In 6-year tests oil used with arsenate of lead has not materially improved control and has complicated washing practices.

The biological control of sugar cane pests, W. R. THOMPSON (*Indian Jour. Agr. Sci.*, 2 (1932), No. 4, pp. 409-417).—This contribution was presented at the Imperial Sugar Cane Research Conference held at London in 1931 (E.S.R., 66, p. 824).

[Contributions on fruit insects and their control, etc.] (*Mass. Fruit Growers' Assoc. Rpt.*, 38 (1932), pp. 21-25, 27-29, 128-142, 154-156, 158-164, 178, 182-184).—The contributions presented at the annual meeting of the Massachusetts Fruit Growers' Association (E.S.R., 67, p. 427) held in January 1932 include the following: The Oriental Fruit Moth (pp. 21-25, 27-29) and Notes on the Control of the Apple Leafhoppers [the Rose Leafhopper, Apple Leafhopper, Potato Leafhopper, *Typhlocyba pomaria* McAtee, and *Erythroneura obliqua* Say] in Connecticut (pp. 128-132), both by P. Garman; Control Studies of Apple Maggot in 1931, by A. I. Bourne and W. H. Thies (pp. 133-137); Relation of Temperature to the Activity of the Plum Curculio, by W. D. Whitcomb (pp. 138-142); Spray Materials and the Residue Problem, by O. C. Roberts and A. I. Bourne (pp. 154-156, 158-161); Summary of Orchard Insect Pests in 1931, by A. I. Bourne (pp. 162-164); Results of the New England Apple Maggot Conference, by R. A. Van Meter (p. 178); Revision of the Partridge Damage Law, by C. H. Gould (pp. 182-184); and Report of Orchard Pest Committee, by H. Gilmore (p. 184).

[Contributions on avocado insects and their control] (*Calif. Avocado Assoc. Yearbook 1932*, pp. 38-43, 46-48).—Three contributions from the California Citrus Experiment Station are here presented: The Trend of Avocado Pests and Their Control (pp. 38, 39), Control of Avocado Scale (pp. 40-43), and Progress Report on Avocado Insect Pest Investigations (pp. 46-48), all by H. J. Quayle.

Insect pests of citrus and their control, S. W. CLARK (*Texas Sta. Circ.* 67 (1933), pp. 40-49, figs. 8).—The insects mentioned as of major importance as enemies of citrus in the Lower Rio Grande Valley of Texas include the California red scale, purple scale, rust mite, fire ants, chaff scale, and red spiders. Insects of minor importance referred to include the long or Glover's scale, cottony-cushion scale, soft brown scale, and several other forms.

[Annual report of the Indian Lac Research Institute for the year 1931-32], P. M. GLOVER (*Indian Lac Res. Inst. Ann. Rpt. 1931-32*, pp. 44, pls. 6).—Included in this report (E.S.R., 66, p. 154) are accounts of pests of lac host trees (pp. 15-20), of the bionomics of the lac insect (*Laccifer (Tachardia) lacca* Kerr) (pp. 20-23), of predators (pp. 23-27) and of parasites (pp. 27, 28) of the lac insect, and of the control of lac insect enemies (pp. 29-36).

[Contributions on insects attacking shade and ornamental trees] (*Natl. Shade Tree Conf. Proc.*, 8 (1932), pp. 23-31, 70-81, 89-93).—The entomological contributions presented at the eighth annual meeting of the National Shade Tree

Conference, held at Rochester, N.Y. (E.S.R., 67, p. 565), include the following: Some Conditions Leading to the Attack of Shade and Ornamental Trees by Borers, by W. Middleton (pp. 23-31); The Relation of Gipsy Moth Control to the Shade Tree Problem, by A. F. Burgess (pp. 70-76); Shade Tree Insects in 1932, by E. P. Felt (pp. 76-81); and Studies of Some Insects of Evergreens, by F. L. Gambrell (pp. 89-93).

The fumigation of stored products affected by insects, J. W. MUNRO (*Jour. Roy. Sanit. Inst.*, 53 (1933), No. 10, pp. 578-582).—A general discussion.

Biennial report of the State entomologist for 1929-1930, M. S. YEO-MANS ET AL. (*Ga. State Bd. Ent. Bul.* 75 (1931), pp. 52).—The work under way during the biennium 1929-30 is reported upon.

[Contributions on economic insects in Hawaii] (*Hawaii. Ent. Soc. Proc.*, 8 (1932), No. 1, pp. 37-39, 111-120, 127-140, 163-190, 193-195).—Contributions relating to economic insects here presented are as follows: Some Effects of *Pseudococcus brevipes* (Ckl.) on Pineapple Fruit, by W. Carter and K. Ito (pp. 37-39); Hymenopterous Parasites of the Coccidae, etc., in Hawaii, by D. T. Fullaway (pp. 111-120); The Host Trees of the Endemic Cerambycidae in Hawaii, by O. H. Swezey (pp. 127-140); The Economic Importance of the Mediterranean Fruit Fly to Hawaiian Horticulture, by A. C. Mason (pp. 163-178); Some Observations on Forest Insects at the Nauhi Nursery and Vicinity on Hawaii, by O. H. Swezey and F. X. Williams (pp. 179-190); and Notes on a Small Collection of Philippine Weevils That Feed in the Fleshy Receptacles or "Fruits" or Wild Figs, by F. X. Williams (pp. 193-195).

[Contributions on economic insects and their control in Illinois] (*Ill. State Hort. Soc. Trans.*, 66 (1932), pp. 150-163, 168-172, 307-310, 376-379, 541-548, figs. 2).—These contributions include the following papers: Advances in Codling Moth Control, by W. P. Flint (pp. 150-163); Codling Moth Bands, by M. D. Farrar (pp. 168-172); Observations on Orchard Insect Pests in Northern Illinois for the Season of 1932 (pp. 307-310) and Suggestions for Insect Control on Vegetable Crops (pp. 376-379), both by L. H. Shropshire; Adapting Northwest Codling Moth Control Methods to Midwest Conditions, by R. Dorman (pp. 541-543); and Suggestions for Codling Moth Control, by D. E. Lewis (pp. 543-548).

[Report of work in entomology at the Maine Station] (*Maine Sta. Bul.* 363 (1932), pp. 266-270, 301, 302, fig. 1).—The work of the year, progress in which is reported upon, includes that with blueberry pollination, by C. R. Phipps, F. B. Chandler, and I. C. Mason; wireworms, by J. H. Hawkins; apple fruit fly or railroad worm, by Phipps; insects in relation to virus diseases of potatoes, by G. W. Simpson; and the apple maggot, by Phipps.

[Report of work in insect control at the New Hampshire Station] (*New Hampshire Sta. Bul.* 270 (1933), pp. 11, 12).—Brief reference is made to work aimed at the development of new contact insecticides and the control of the apple maggot, by W. C. O'Kane, and at the reduction of spray residue, by G. P. Percival and G. F. Potter.

[Contributions on economic insects and their control in Virginia] (*Va. State Hort. Soc. Rpts.* 36 (1931), pp. 134-138, 150-161, 164-169, 207-213 fig. 1; 37 (1932), pp. 73-82, 85-92, 147-157, 170-181, figs. 5).—The entomological contributions presented at the annual meeting of the Virginia State Horticultural Society held in Winchester in December 1931 (E.S.R., 67, p. 283), include the following: Can Codling Moth Be Controlled by Arsenical Sprays? by W. S. Hough (pp. 134-138); Importance of Bees in Pollination, by E. F. Phillips (pp. 150-161); and What to Expect from the Oriental Fruit Moth in 1932, by L. R. Cagle (pp. 164-169). In the appended proceedings of the Virginia Bee-

keepers Association, contributions are presented on Causes of Fermentation of Honey, by E. F. Phillips (pp. 207-212), and Bees for Orchards, by C. W. Cary (pp. 212, 213).

The contributions presented at the 1932 meeting include the following: The Scale Menace to Virginia Orchards, by T. W. Ayers (pp. 73-76); The Scale Menace to Virginia Orchards, by A. H. Teske (pp. 76-82); Spraying for Apple Leafhoppers, by W. J. Schoene (pp. 85-88); Developments in Codling Moth Control, by W. S. Hough (pp. 88-92); The Place of Stationary Spray Outfits in Virginia, by H. H. Gordon (pp. 147-157); and The Japanese Beetle in Virginia, by C. H. Hadley (pp. 170-181).

The insects of Japan illustrated, T. ESAKI, H. HORI, ET AL. (*Nippon Konchu Zukan. Iconographia Insectorum Japonicorum. Hokuryukan, Tokyo, 1932*, pp. [6]+97+123+[2]+15+[2241+30], pls. 24, figs. 4440; Sup., pp. [2+70+2], figs. 54; rev. in *Jour. Econ. Ent.*, 25 (1932), No. 5, pp. 1117, 1118).—This double column octavo work, prepared by 26 of the leading entomological specialists in Japan, describes and illustrates more than 4,000 species of insects inhabiting Japan and Taiwan. The work includes, first, a 97-page scientific index, followed by a 123-page Japanese index. A table of the orders of insects, next presented, is followed by the main body of the text, which takes up the orders of insects, two species being illustrated side by side on each page, a detailed account in Japanese being given beneath each figure. The work concludes with 24 colored plates of insects, of which 2 each are devoted to eggs, larvae, and pupae. The review is by C. P. Alexander.

Studies on aster yellows in some new host plants, L. O. KUNKEL (*Contrib. Boyce Thompson Inst.*, 3 (1931), No. 1, pp. 85-123, figs. 50).—The author reports the experimental transmission of aster yellows to 120 new host species, representing 30 different families of plants, the most striking symptoms of each host plant being described. The disease was carried to all host plants except the tomato by means of the six-spotted leafhopper. It was not transmitted mechanically by means of juice from diseased tissues to any plant, but was transferred to the tomato by budding. The disease was not transmitted to potato, tobacco, peach, celery, and *Zinnia elegans* after repeated exposure to virus-bearing colonies of the six-spotted leafhopper.

Insect transmission of peach yellows, L. O. KUNKEL (*Contrib. Boyce Thompson Inst.*, 5 (1933), No. 1, pp. 19-28, figs. 3).—In experimental work extending over a 5-year period peach yellows was transmitted to seven young seedling peach trees by the leafhopper *Macropsis trimaculata* (Fitch), about 10 percent of the trees exposed to this leafhopper having become diseased. The disease was not transmitted by the green peach aphid, black peach aphid, tarnished plant bug, peach borer, mealybugs (the citrus mealybug and long-tailed mealybug), froghopper (*Philaenus leucophthalmus* (L.) var. *pallidus* (Zett.)), treehoppers (*Thelia bimaculata* (Fab.) and the buffalo treehopper), or leafhoppers (*Graphocephala coccinea* (Forst.), the rose leafhopper, *Jassus olitorius* Say, *Fieberiella flori* (Stal.), or *Erythroneura obliqua* Say). It had previously been shown that the six-spotted leafhopper, which is known to transmit aster yellows to a large number of different plants including one species belonging in the Rosaceae, is unable to transmit aster yellows to the peach and is probably not a vector of peach yellows (see above).

Morphological and cytological studies on the salivary glands and alimentary tract of *Cicadula sexnotata* (Fallen), the carrier of aster yellows virus, I. D. DOBROSKY (*Contrib. Boyce Thompson Inst.*, 3 (1931), No. 1, pp. 39-58, figs. 7).—A comparative morphological and cytological study of virus-free and virus-bearing individuals of the six-spotted leafhopper, shown by Kunkel (see above) to transmit the virus of aster yellows, did not reveal the presence

of any organism that could be associated with the transmission of the virus of aster yellows by this insect.

Transmission of bean-mosaic virus by insects, W. J. ZAUMEYER (*Phytopathology*, 23 (1933), No. 1, p. 40).—Under controlled greenhouse conditions the virus of bean mosaic is said to have been transmitted by feeding virus-free aphids on mosaic infected beans for from 24 to 30 hours and then transferring the insects to healthy plants. In addition to the potato aphid, the bean aphid, and the green peach aphid, shown by other investigators to be vectors, the following aphids were found by the author to transmit the virus also: The pea aphid, melon aphid, cabbage aphid, chenopodium aphid (*Hyalopterus atrifolius*), and an aphid (*Macrosiphum ambrosia*) common on wild Compositae. All these species, except *M. ambrosia*, have been found on beans in the field.

The efficiency of traps in controlling the European earwig, *Forficula auricularia* Linn., in British Columbia, G. BEALL (*Bul. Brooklyn Ent. Soc.*, 27 (1932), No. 5, pp. 231–238, fig. 1).—The author found that trapping on a single lot caused some lowering of the level of population of the European earwig, but that the rapid infiltration from surrounding nontrapped lots nullified these results on the whole.

The thrips situation in southern California, E. A. MCGREGOR (*Calif. Citrogr.*, 18 (1933), No. 5, pp. 128, 160, figs. 2).—This is a discussion of the occurrence and control of the citrus thrips in southern California, where during the last two or three years a much larger percentage of citrus has been attacked, with a noticeable increase in the extent of grade reduction of fruit.

[Contributions on the gladiolus thrips, *Taeniothrips gladioli*] (In *New England Gladiolus Year Book 1933*. [Ashland, Mass.: C. W. Brown, Sec.], 1933, pp. 113–123, 124).—Contributions on *T. gladioli* are as follows: "Thrip-Resistant" Varieties, by E. Seeley (p. 113); The Gladiolus Thrips, by C. A. Weigel (pp. 114–116); The Menace of Thrips, by H. O. Evans (pp. 117–119); Combating Gladiolus Thrips, by W. D. Whitcomb (pp. 119, 120); Some Problems of Thrip Control, by F. C. Hornberger (pp. 120, 121); Successful Methods of Controlling Thrip, by B. Steffanson (pp. 121, 122); Recommendations for the Control of Thrip, by A. G. Dustan (p. 122); Thrip Will Be Controlled, by C. E. F. Gersdorff (pp. 122, 123); and Throttling the Thrip, by A. A. Arenius (p. 124).

The Cydnidae and Pentatomidae of Cuba, H. G. BARBER and S. C. BRUNER (*Jour. Dept. Agr. Puerto Rico*, 16 (1932), No. 3, pp. 231–284, pls. 3, fig. 1).—This is a synopsis of the Cydnidae and Pentatomidae of Cuba. Notes on their occurrence include descriptions of two new species of Cydnidae, a new genus (*Praepharnus*), and nine new species of Pentatomidae.

The grape leafhopper in California, with special reference to its control, S. LOCKWOOD (*Calif. Dept. Agr. Mo. Bul.*, 21 (1932), No. 10–11, pp. 375–393, figs. 9).—This is a summarized account of the biology, economic importance, and control of the grape leafhopper, which has been responsible for loss to vineyardists over a major portion of the grape-growing regions of the United States and Canada. It has been particularly abundant in the San Joaquin Valley since 1929.

Blossom-blight of mangos in the Philippines, F. B. SERRANO and M. A. PALO (*Philippine Jour. Sci.*, 50 (1933), No. 3, pp. 211–277, pls. 17).—This is a report of studies of an affection of the mango known as blossom blight, which is caused by the leafhoppers *Idiocerus clypealis* Léth. and *I. niveosparsus* Léth., thus far the most destructive and most common pest of mangoes known in the Philippines. It has been observed to attack all the different varieties of mangoes, all being equally susceptible to the infestation under more or less identical conditions.

An application of a nicotine soap solution containing 0.36 percent of soap and 0.12 percent of Blackleaf 40 (nicotine sulfate) proved to be the most effective and most economical for spraying the carabao variety. For the pico variety, which seems to possess a more delicate blossom, a solution containing 0.3 percent of soap and 0.05 percent of Blackleaf 40 showed the best results. In places where there was a lack of water supply, light trapping as a means of minimizing the ravages, particularly of the large species *I. niveosparsus* Léth., was used to advantage.

Two new genera and species of Aphididae (Homoptera), A. A. GRANOVSKY (*Ent. Soc. Wash. Proc.*, 35 (1933), No. 3, pp. 29-43, pl. 1).—Contributing from the Minnesota Experiment Station, the author erects the genera *Hoplochaitophorus*, of which *Chaitophorus quercicola* Mon. is the genotype, and *Lachnochaitophorus*, of which *L. querceus* n.sp., collected on *Quercus velutina* and *Q. borealis* at Egg Harbor, Wis., is the genotype. *L. bisselli*, which inhabits the small twigs and leaf petioles of *Q. nigra* and is always associated with ants, *Crematogaster lineolata*, from Thomasville, Ga., is described as new.

The green peach-aphis (*Myzus persicae* Sulz.) and a new pyralid mango defoliator (*Orthaga mangiferae* n. sp.), C. S. MISRA (*Indian Jour. Agr. Sci.*, 2 (1932), No. 5, pp. 536-541, pls. 3, fig. 1).—The author records the sudden appearance of the green peach aphid and its serious injury to fruit trees in north Bihar, where it had not been recorded heretofore, followed by a sudden disappearance. A descriptive and preliminary account of *O. mangiferae* n.sp. on mango trees follows.

The oak scale and its parasite, H. M. NICHOLLS (*Tasmanian Jour. Agr.*, 4 (1933), No. 1, pp. 24-26, fig. 1).—This is an account of the pit-making scale, *Asterolecanium variolosum*, of the imported European oak and the status of its hymenopterous parasite *Habrolepis dalmanni*. The latter, the only known internal parasite of this scale, was introduced from America and liberated on oak trees in the neighborhood of Christchurch, New Zealand. It is said that this parasite has now become established and is doing effective work in checking ravages of the scale.

Elimination of natural mortality as a factor in determining the effectiveness of hydrocyanic acid gas on the California red scale, F. S. STICKNEY and H. R. YUST (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 5, pp. 437-447, figs. 2).—This contribution reports upon work conducted with a view to determining the amount of fluctuation that may be expected in natural mortality of the California red scale.

The authors found that on untreated lemon fruits infested with the California red scale the number of dying female scales of the three later stages, taken separately or collectively, bears a nearly constant ratio to the number of living plus dying scales, irrespective of a large number of varying factors commonly encountered in practice. This ratio, considered as indicating natural mortality, can be assumed to be equal to approximately 4 per cent, at least for the period and locality covered. Natural mortality as thus expressed can be eliminated as a factor in determining the effectiveness of hydrocyanic acid gas treatments with closer accuracy than by the familiar method of estimating it from the ratio of living scales to the total scale count (including dead, dried specimens).

What butterfly is that? A guide to the butterflies of Australia, G. A. WATERHOUSE (*Sydney: Angus & Robertson*, 1932, pp. [8]+291, pls. 34, figs. 4).—This work, which has been prepared with a view to ready identification of the butterflies of Australia, some 339 in number, includes brief descriptions and plates with colored illustrations by N. W. Cayley.

Researches on the urticant spines of caterpillars [trans. title], P. R. TONKES (*Bul. Biol. France et Belg.*, 67 (1933), No. 1, pp. 44-99, pls. 3).—This contribution is presented in connection with a three-page list of references to the literature.

Studies on chemical changes during the life cycle of the tent caterpillar (*Malacosoma americana* Fab.).—V, **Weight and data**, W. RUDOLFS (*Jour. N.Y. Ent. Soc.*, 40 (1932), No. 4, pp. 481-488, fig. 1).—In this further contribution from the New Jersey Experiment Stations on the chemical changes taking place in the life cycle of the eastern tent caterpillar (E.S.R., 61, p. 661), the author reports upon the size, weight, and chemical constituents of its several stages, the details being presented in tabular form.

Biology of the bidens borer, *Epiblema otiosana* (Clemens) (Lepidoptera, Olethreutidae), G. C. DECKER (*Jour. N.Y. Ent. Soc.*, 40 (1932), No. 4, pp. 503-509, fig. 1).—This contribution from the Iowa Experiment Station reports upon a lepidopteran generally regarded as of little economic importance. It is, however, of considerable interest, being an important enemy of a group of noxious weeds known as beggar-ticks and also serving as a reservoir for important parasites of several injurious insects.

On the biology of the species of *Chrysoclista* infesting hawthorn, M. MILES (*North West. Nat.*, 7 (1932), No. 4, pp. 294-298, pl. 1).—This contribution relates to two forms or species of moths of the genus *Chrysoclista*, one known as the apple shoot and the other as the hawthorn fruit form. The former emerges during the latter part of July and is on the wing until mid-August, while the hawthorn fruit form is on the wing mainly in June. The eggs of the hawthorn form are laid on the fruits, while those of the apple form are laid on the twigs, usually in the leaf axils. The larva of the hawthorn *Chrysoclista* tunnels almost immediately into the fruit and feeds on the pericarp; the larva of the apple *Chrysoclista* tunnels into the twig and feeds on the woody tissue.

Biology and morphology of the spindle worm, or elder borer, J. C. SILVER (*U.S. Dept. Agr., Tech. Bul.* 345 (1933), pp. 20, figs. 9).—Reports that *Achatodes zeae* Harr. was attacking corn, the larvae being sometimes mistaken for the European corn borer, led to the investigations of it conducted from the European corn borer laboratory at Toledo, Ohio. This noctuid at times seriously injures several species of elder but very rarely injures corn. The larval period is of short duration, being usually confined to uneconomic plants. Natural control by several species of parasites and by birds and rodents usually holds it in check. It is pointed out that the eggs are easily destroyed during the fall and winter months by burning the old, dead elder wood to which they are attached.

Spraying for codling moth control, H. N. WORTHLEY (*Pennsylvania Sta. Bul.* 285 (1933), pp. 16, figs. 4).—This is a report of the results of spraying experiments for the control of the codling moth conducted in the heavily infested apple orchards of Adams County during the seasons of 1931 and 1932.

"A petal-fall and four first-brood cover sprays gave the most promise of killing enough first-brood larvae to reduce heavy second-brood attack. Arsenate of lead at less than 3 lb. to 100 gal. was useless in a heavy codling moth infestation, even with a casein spreader and sticker added. On Grimes sprayed last on July 30 even a reduced dosage of arsenate of lead produced excessive arsenical residue. Sprays timed for the second brood of larvae would have been applied in mid-August. The addition of hydrated lime to the standard spray mixture containing arsenate of lead at 3 lb. to 100 gal. resulted in greatly reduced effectiveness. The addition of fish oil at 1 qt. to 100 gal. increased the

effectiveness of the spray. The use of a miscible oil to replace a portion of the arsenate of lead did not yield satisfactory results. Nicotine tannate as a substitute for arsenate of lead was unpromising. Arsenate of lead at standard strength in a schedule of four first-brood cover sprays, and at reduced strength in a late July spray, resulted in 50 percent reduction in codling moth population in 1932, as compared with 1931. The petal-fall application was as valuable as any cover spray in codling moth control. With the possible exception of the first cover spray, all the applications, as timed by codling moth catch in bait pails, resulted in increased control."

Cocoon parasites of the oriental fruit moth, B. F. DRIGGERS (*Jour. N.Y. Ent. Soc.*, 40 (1932), No. 4, pp. 489-496).—Reporting upon studies conducted at the New Jersey Experiment Stations the author calls attention to the fact that the work on parasites of the oriental fruit moth has dealt largely with those species which attack the egg and feeding larva, little attention having been given to the species attacking the cocoon stages.

"Studies carried on in New Jersey from 1928 to 1930 show (1) that a high percentage of parasitism may be found in overwintering hibernacula collected in the spring, (2) that for the most part the species encountered are not the same as those found attacking the egg or feeding larval stages, and (3) that the majority of this parasitism takes place after the cocoon is formed or during the process of cocoon formation."

The life history and control of the oriental fruit moth, C. H. ALDEN and W. H. CLARKE (*Ga. State Bd. Ent. Bul.* 74 (1931), pp. 23, figs. 6).—The life history of the oriental fruit moth at Fort Valley, Ga., in 1925 and 1926 (pp. 11, 12) and at Thomaston, Ga., in 1930 (pp. 12-16) is given particular attention in this account.

A contribution to the study of the genera *Ephestia* Gn. (including *Strymax* Dyar) and *Plodia* Gn. (Lepidoptera, Phycitidae), with notes on parasites of the larvae, O. W. RICHARDS and W. S. THOMSON (*Ent. Soc. London, Trans.*, 80 (1932), pt. 2, pp. 169-250, pls. 8).—This contribution, which includes descriptions of 4 new species, is presented in connection with a 16-page list of references to the literature.

Cacao beans and *Ephestia elutella*, R. V. WADSWORTH (*Trop. Agr. [Trinidad]*, 10 (1933), No. 4, pp. 97-100).—The author has found that the cacao bean properly fermented and with its shell intact is proof against the attack of *E. elutella*. The damage caused by this pest is due to the presence of defective beans in the parcel, including partially cracked, germinated, and broken beans. Cut and unfermented beans are also a source of infestation.

Life history of the Angoumois grain moth in Maryland, P. SIMMONS and G. W. ELLINGTON (*U.S. Dept. Agr., Tech. Bul.* 351 (1933), pp. 35, figs. 10).—Following a brief introduction the authors consider the Angoumois grain moth as it occurs in Maryland (pp. 2-14), its life history, the details of which are presented in tabular form (pp. 14-31), its parasites (p. 31), and outbreaks in the past and future (pp. 31, 32). The report is based upon studies commenced in May 1923 in Montgomery County and continued until the close of the summer of 1927, preliminary accounts having been noted (*E.S.R.*, 51, p. 159; 53, p. 454; 57, p. 361; 63, p. 461).

The Angoumois grain moth survives the period of unfavorably cold weather, about 6 months in Maryland, for the most part as larvae enclosed in kernels of grain in storage and in scattered wheat in litter, straw piles, and baled straw. The winter mortality, however, appears to be high, and there is no survival in planted wheat. The adults commence to emerge about the middle of May, and some of those which appear before the wheat harvest fly to the fields to deposit eggs upon the developing grain. Later, the harvested grain is attacked, both

before and after threshing. The second brood of adults appears soon after wheat harvest, which begins in late June or early July, infestation increasing most rapidly during July and August.

Of the influences that antagonize the species, parasites are relatively unimportant. Since the young larvae are able to establish themselves on wheat before the plant has blossomed and even before the heads appear, clean-up operations to reduce moth sources on farms should be completed before the wheat is headed, preferably before May 1. Such field infestation arises from wheat in bins, litter, and straw, and from stored ear corn.

Although infestations of standing wheat expressed as percentages usually are small, they represent large populations per acre. Upon this widespread field infestation depends the ability of the insect to cause commercial damage. Infestation of field corn at harvest time is general but light, being confined for the most part to the exposed tips of ears grown near sources of moths in and about farm buildings.

In hot weather the eggs hatch after an incubation period of from 4 to 8 or more days, the newly hatched larva boring into the host seed within a short time and thereafter feeding entirely within the grain. Pupation takes place in a silken cocoon constructed in the cavity which results from larval feeding. The development of the insect, from hatching to emergence, may be completed in as short a time as 29 days, but longer developmental periods are the rule, and the rapidity of the growth and metamorphosis of individuals which hatch on the same day varies markedly. The temperature within which reproduction occurs is from 64° to 95° F.

An unusual invasion of the clothes moth, *Tineola bisselliella* (Lepid.: Tineidae), G. W. HERRICK (*Ent. News*, 44 (1933), No. 4, pp. 99-101).—The author records a case in which an infestation of raw wool in a warehouse by the webbing clothes moth resulted in spread of the pest to residences in the neighborhood.

Clothes moths and house moths: Their life-history, habits, and control, E. E. AUSTEN and A. W. McK. HUGHES (*Brit. Mus. (Nat. Hist.), Econ. Ser. No. 14* (1932), pp. 56, figs. 20).—This, a practical compilation of information presented with references to the literature, includes an index to the subject matter.

The duration of Eulan protection against the webbing clothes moth, I [trans. title], A. HASE (*Anz. Schädlingssk.*, 8 (1932), No. 7, pp. 73-82, figs. 5).—The genuine protection of woolen from moth injury for longer than 10 years through impregnation with Eulan F is reported.

Experimental studies on the influence of low temperatures upon the development of paddy borer (*Schoenobius incertellus* Walk.).—**First report** [trans. title], K. SHIBATA (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaishi)*, 4 (1932), No. 4, pp. 504-516, figs. 2; *Eng. abs.*, p. 516).—In studying the resistance of *S. incertellus*, one of the most serious pests of the rice plant in Japanese territory, larvae and pupae were found to be injured by sudden exposure to a low temperature.

Larval instars and feeding of the black cutworm, *Agrotis ypsilon* Rott., A. F. SATTERTHWAIT (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 6, pp. 517-530, figs. 3).—Outbreaks of the black cutworm in the overflow land of the Black River in the neighborhood of Hoxie, Ark., following inundations that affected thousands of acres of cornland in 1927 and 1928, led to the studies here described which include experimental work at Webster Groves, Mo.

There were found to be three generations of the black cutworm a year at Webster Groves. "The growth of larvae in general, judged by head measurements, is approximate to one and a half times the size of the preceding head

width, if the growth is completed in six instars. Where more instars occur, the increase after the sixth is greatly reduced for the subsequent stages. Increases in size between instars, especially in the first three, may be much greater; rarely the width in the second instar measures twice the width in the first.

"The quantities of food eaten in the first three instars are small, then increase abruptly, especially between the fifth and sixth instars, in the individuals maturing in six instars. The measurement of food eaten was possible when corn foliage alone was supplied. In nature, the larvae bite off and then discard entire plants, thus getting an unknown volume of plant tissue and wasting perhaps a thousand times more than they consume. When fed corn foliage exclusively, a larva which undergoes six instars will eat the equivalent of 65 sq. in. of corn leaf. The feeding of the larvae which eventually yield females is appreciably heavier than that of larvae which yield males, and is lighter in the July than in the May brood."

Notes on the biology of *Laphygma exigua* Huebner, J. W. WILSON (*Fla. Ent.*, 16 (1932), No. 3, pp. 33-39).—This is a contribution from the Florida Experiment Station reporting upon observations of the life history and habits of the beet armyworm, the most important enemy of the asparagus fern in Florida, occurring from Auburndale north. Injury is caused by the first and second instar larvae, which climb to the tip of the asparagus shoot and feed on the tender bud, causing it to curl over and eventually to wither. The older larvae feed on any part of the plant, preferring the soft succulent syrays which have just finished expanding. The average length of the life cycle of six generations was 24 days. Of eight parasites observed, *Chelonus texanus* Cress. was by far the most abundant.

Life-histories of Indian Microlepidoptera (second series): Alucitidae (Pterophoridae), Tortricina, and Gelechiadae, T. B. FLETCHER (*Imp. Council Agr. Res. [India], Sci. Monog.* 2 (1932), pp. 58, pls. 35).—This second series (see page 373) deals with the life histories of species of moths belonging to the families Alucitidae, Tortricidae, and Gelechiidae.

Anopheline mosquitoes in Southern Rhodesia, 1926-1928, H. S. LEESON (*London School Hyg. and Trop. Med. Mem.* 4 (1931), pp. IX+55, pls. 15, figs. 10).—This is a report of investigations of mosquitoes made during the course of studies of black-water fever by G. R. Ross.

Anopheles walkeri Theobald as a vector of *Plasmodium vivax* Grassi and Feletti, R. MATHESON, M. F. BOYD, and W. K. STRATMAN-THOMAS (*Amer. Jour. Hyg.*, 17 (1933), No. 2, pp. 515, 516).—The authors have found *A. walkeri* to be an efficient definitive host for *P. vivax*.

Hydrodynamics of mosquito breeding places, P. I. DE JESUS (*Amer. Jour. Hyg.*, 17 (1933), No. 2, pp. 502-514, figs. 2).—A study of the hydrodynamics of a typical *A[nopheles] minimus* breeding place showed that the maximum occurrence and intensity of larvae are found in portions of the stream with low velocity. In a number of malarial localities *A. minimus* was found breeding in stagnant seepage pools and surface wells, showing that it is not confined entirely to flowing water.

The hydrogen-ion concentration as a factor concerned in the breeding of mosquito larvae, A. A. ALBANESE (*Magyar Biol. Kutató Intézet Munkái (Arb. Ungar. Biol. Forsch. Inst.)*, 5 (1932), pp. 168-176, figs. 2).—The author has found that larvae of the malaria mosquito *Anopheles maculipennis* are more sensitive to variations of the water reaction than are those of the house mosquito *Culex pipiens*. "It may be stated that although *C. pipiens* larvae were found to breed in waters of a wide pH range, the fact that 90 percent of this

group are in the region pH 7.90 to 8.59 points to a limited toleration, or a restricted preference, of this species to the reaction of the breeding waters. There is evidence that the alkalization of breeding water containing larvae in the laboratory is caused by the larvae themselves, and that the rate of hydrogen-ion decrease is greater for the *C. pipiens* as a group."

It is concluded that the pH index of the breeding water is of some bionomic importance both for the presence and development of mosquito larvae.

The effect on *Culex* larvae of paris green diluted with charcoal and notes on the feeding habits of *Culex quinquefasciatus*: Larvicide studies, V, P. F. RUSSELL and A. P. WEST (*Philippine Jour. Sci.*, 49 (1932), No. 4, pp. 651-675, pls. 3, fig. 1).—In continuation of larvicide studies (E.S.R., 68, p. 644), the authors found that charcoal at the rate of 99 parts to 1 part of paris green is an effective larvicide against *Culex* mosquitoes in laboratory containers and in a still pond. It was found that the larvae of *C. quinquefasciatus* feed at the surface, below the surface, and at the bottom of shallow water. It appears that paris green, if supported by charcoal and kept afloat, will not only destroy all *Anopheles* larvae but will kill a high percentage of *C. quinquefasciatus* larvae as well.

An investigation on petroleum oils for malaria control purposes, G. C. RAMSAY and J. A. CARPENTER (*Rec. Malaria Survey India*, 3 (1932), No. 2, pp. 203-218).—A report of studies conducted at Syriam, Rangoon, and in the Southern Shan States during January and February 1932.

The geographical distribution of the yellow fever vectors, H. W. KUMM (*Amer. Jour. Hyg., Monog. Ser.* 12 (1931), pp. III+110, figs. 19).—This is a compilation of material recorded in the literature, unpublished communications, and certain collections made by the author in Nigeria, West Africa. The data are presented in connection with a bibliography of 320 titles and illustrated by 19 outline maps.

The adaptation of mosquito larvae to salt water, V. B. WIGGLESWORTH (*Jour. Expt. Biol.*, 10 (1933), No. 1, pp. 27-37, figs. 2).—It was found in yellow-fever mosquito work that larvae reared in fresh water were unable to withstand very high concentrations of salt water, but could by gradually increasing the concentration be made resistant to 1.1 percent sodium chloride and to "sea water" equivalent to 1.75 percent sodium chloride.

***Dasyneura leguminicola* (Lint.), the clover seed midge, M. E. METCALFE** (*Ann. Appl. Biol.*, 20 (1933), No. 1, pp. 185-204, pl. 1, figs. 2).—The author has found that the clover seed midge destroying clover seed in England, which is the same as that common in the United States, is typically two-brooded, the second brood overwintering in the larval stage. The varieties of red clover tested were found to be susceptible to attack, white clover being resistant. The author suggests that unless a resistant variety can be produced, clovers grown for seed production be chosen with a view to their being in the green-head stage either before or after the time of maximum emergence of the midges. It is pointed out that if cutting of the first crop is used as a means for destroying the second brood of midges this should take place within 10 days of the crest of emergence.

A list is given of 36 references to the literature.

Control of crane fly larvae (*Tipula paludosa* Mgn. and *T. oleracea* L.) by use of chemical [trans. title], H. GASOW (*Landw. Jahrb.*, 77 (1933), No. 1, pp. 69-112, figs. 4).—This contribution is presented with a list of 57 references to the literature.

Notes on the tachinid genus *Elodia* R. D., with three new species of *Elodia* and *Phorocera* (Diptera) from Japan, J. M. ALDRICH (*Ent. Soc.*

Wash. Proc., 35 (1933), No. 2 pp. 19-23).—The species *E. flavipalpis*, *E. subfasciata*, and *P. pumilio*, reared in Japan and Chosen (Korea) from larvae of the oriental fruit moth, are described as new.

Food requirements of blowfly cultures used in the treatment of osteomyelitis, J. G. HAUB and D. F. MILLER (*Jour. Expt. Zool.*, 64 (1932), No. 1, pp. 51-56, fig. 1).—In a series of experiments conducted with a view to eliminating much of the routine involved in the rearing of sterile blowfly larvae for the treatment of osteomyelitis, a diet of lean beef was found the most satisfactory of eight different types of meat foods for this purpose. Of the various diets tested for the adult flies brick sugar, fresh lean beef, and fresh water was adopted. On this diet the average length of oviposition period in a cage of flies was 30 days when the eggs were collected three times per week. This diet was used for 10 months over a period covering 10 generations and found efficient.

The nutrition of flesh fly larvae, *Lucilia sericata* (Meig.).—I, **The adequacy of sterile synthetic diets**, A. E. MICHELbacher, W. M. HOSKINS, and W. B. HERMS (*Jour. Expt. Zool.*, 64 (1932), No. 1, pp. 109-131, pl. 1, fig. 1).—The authors describe a method of sterilizing the eggs and the larval food of the flesh fly *L. sericata* which they developed and have used in a study of the nutritional needs of the larvae. The account is presented in connection with a list of 31 references to the literature.

Notes on the life cycle of *Oestrus ovis*, W. C. MITCHELL and N. G. COBBETT (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 5, pp. 780, 781).—The authors have found that the larvae of the sheep botfly develop to maturity in 2½ to 3½ months in the heads of spring lambs in western Texas and eastern New Mexico. The time required for mature larvae to pupate at ordinary room temperature varied from 12 to 72 hours, and the time required for flies to emerge from these pupae under similar conditions varied from 17 to 37 days. Flies kept in captivity lived from 4 to 32 days. It thus appears that the life cycle of the sheep botfly may be completed in lambs in 3½ to 4½ months in western Texas and eastern New Mexico.

The apple maggot, C. R. PHIPPS (*Maine State Pomol. Soc. Ann. Rpt. 1931*, pp. 13-20; *abs. in Maine Sta. Bul.* 363 (1932), pp. 301, 302).—This general account includes a report of dispersal work, an account of which by the author and Dirks from another source has been noted (*E.S.R.*, 67, p. 716). Dispersal studies by the station in 1932 as well as of the biology of the pest have also been noted (*E.S.R.*, 69, p. 244).

It was observed in field work that dispersal is often a gradual process, the flies migrating from tree to tree as the later varieties become more attractive. The earlier varieties, such as Red Astrachan, are most attractive at first, but after the first of August flies begin to concentrate on later varieties, such as Wealthy, Rhode Island Greening, Baldwin, Northern Spy, and Ben Davis. Both the Golden Delicious and Red Delicious varieties are quite susceptible to attack under Maine conditions.

It is pointed out that in general in well-isolated orchards containing only fall and winter varieties this insect should be readily controlled by one or two thorough and timely spray applications. If both early and late varieties are in the same planting, the drops from the early apples should be picked up and destroyed every two or three days.

Viability of eggs and larvae of the apple maggot (*Rhagoletis pomonella* Walsh) at 32° F., P. J. CHAPMAN (*New York State Sta. Tech. Bul.* 206 (1933), pp. 19, figs. 3).—The experiments reported have shown that all eggs and larvae of the apple maggot succumb when infested fruit has been exposed

to temperatures customarily maintained in fruit cold storage houses, namely, 31° to 33°. "Complete mortality is effected in about 35 days. Refrigeration is proposed as a means of disinfesting apples intended for foreign markets, since at present no tolerance on apple maggot is allowed in such fruit.

"Emergence of larvae from apples starts about July 15 to 20 and may continue into December. While a great majority of larvae in nature are exposed to mean temperatures ranging between 55° and 70° F., evidence shows that late emerging individuals may endure a considerably lower mean temperature and may survive in fruit when subfreezing air temperatures obtain. Resistance of the host to larval establishment varies with the variety of apple. In late-maturing varieties larval mortality may approach or attain 100 percent."

Life history notes and a study of the effects of humidity on adult emergence of *Rhagoletis suavis* Cress. from pupae at a constant temperature (Diptera, Trypetidae), D. E. BECK (*Jour. N.Y. Ent. Soc.*, 40 (1932), No. 4, pp. 497-501, figs. 2).—A brief account is given of observations of the walnut husk maggot (*R. suavis*) as a pest of the black walnut in Iowa.

A practical handbook of British beetles, I, II, N. H. JOY (*London: H. F. & G. Witherby*, 1932, vols. 1, pp. XXVII+622; 2, pp. [4]+194, pls. 170; rev. in *Nature* [London], 130 (1932), No. 3275, pp. 186, 187).—In volume 1, following a preface and introduction, the author deals at length with the classification of British Coleoptera, represented by about 3,560 species. The subject matter is presented in the form of keys to the suborders, families, subfamilies, tribes, genera, and species. Volume 2 is devoted entirely to pen drawing illustrations of their structure. Both volumes include indexes to genera, species, etc.

The review is by A. D. Imms.

The potato *Epilachna* beetle, *Epilachna viginti-octo-punctata* (Fabr.), B. KRISHNAMURTI (*Mysore Dept. Agr., Ent. Ser. Bul.* 9 (1932), pp. 16, pls. 5).—This is a report of a study made of a coccinellid that is a serious pest of the potato, being widely distributed throughout the potato-growing areas of Mysore. In other parts of India, especially in the plains, *E. 28-punctata* and *E. dodecastigma* occur generally on potato, brinjal, tomato, and melon.

Blister beetles and their relation to the honey bee, A. G. BELJAVSKY (*Bee World*, 14 (1933), No. 3, pp. 31-33, figs. 4).—In this account of blister beetles the author points out that the primary larvae or so-called triungulins of *Meloe variegatus* enter the interstices between the abdominal segments and between the rings of the prothorax and mesothorax, and irritate the bee to such an extent that it dies in violent convulsions. In an apiary in Russia the author has observed bees dying by the hundreds as a result of such an attack.

Biology of the flour beetles, *Tribolium confusum* Duv. and *T. ferrugineum* Fab., N. E. GOOD (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 4, pp. 327-334).—This is a preliminary account of a rather extensive experiment on two flour beetles (the confused flour beetle and the rust-red flour beetle) that are among the more serious pests of flour, meal, and other cereal products. It is pointed out that in the identification of the two species the size of the eyes on the ventral surface of the head is the best distinguishing character.

In the central and northern parts of the United States the winter is passed in the adult state, the adults of both species living two years or even longer. The oviposition period of the confused flour beetle may last as long as 14 months, the average being about 9 months. That of the rust-red flour beetle is slightly less. A female of either species usually lays 400 to 500 eggs during this time; in some cases nearly 1,000 eggs have been laid by a single female. The average incubation period at 27° C. is 6.8 days for the confused flour beetle and 5.5 days for the rust-red flour beetle. The number of larval instars

ranges from 6 to 11, with an average of 7 or 8. The larval period at 27° ranges from 27 to 90 days according to the food. It is slightly longer for the confused flour beetle than for the rust-red flour beetle. Whole-wheat flour, middlings, bran, corn meal, oatmeal, and white flour, arranged in the order of their acceptability, were the foods used in the experiments. Measurements of the head capsule in larvae of the confused flour beetle are given. The pupal period at 27° averages 8.2 days for the confused flour beetle and 7.1 days for the rust-red flour beetle. Lower temperatures lengthened all stages considerably.

Enemies of the flour beetles include the mites *Acarophenax tribolii* Newst. and Duval and *Pediculoides ventricosus* Newp. and the bethylid *Rhabdepyris zcae* Waterst.

A mathematical theory of the growth of population of the flour beetle, *Tribolium confusum* Duv.—II, The distribution by ages in the early stages of population growth, J. STANLEY (*Canad. Jour. Res.*, 7 (1932), No. 4, pp. 426-433, fig. 1).—This is in continuation of the contribution previously noted (E.S.R., 68, p. 359).

Prothetely in an elaterid larva (Coleop.), C. A. THOMAS (*Ent. News*, 44 (1933), No. 4, pp. 91-96, figs. 3).—In this contribution from the Pennsylvania Experiment Station, presented in connection with an annotated list of 23 references to the literature, the author describes a case of this unusual metamorphosis in a wireworm, the larva of *Monocrepidius lividus* DeG.

Preliminary studies of the *Syneta* beetle and its control in Oregon, J. WILCOX (*Oregon Sta. Circ. Inform.* 52 (1931), pp. 4).—This account, given in mimeographed form, is based largely upon spray tests conducted on cherries from 1925 to 1930, inclusive. Though attacking apple and pear in the Northwest, *S. albida* is of particular importance as a cherry pest, its injury to the cherry crop in recent years having been rapidly mounting, especially in parts of the Willamette Valley. Injury to some degree is caused by the larvae feeding on the roots of the trees and by the adults feeding on the buds, blossoms, and leaves. The most serious injury, however, is that inflicted on the fruit by the adults. They eat the skin and a small part of the flesh of the fruit in from small to rather large irregular patches, which are later evidenced as shallow, dark-colored scars. This fruit is unsalable and unfit for canning, and consequently the grower suffers a dockage on his weight slip corresponding to the percentage of injury to the fruit. The injury to cherries by this insect apparently occurs in cycles of several years, although the number of years in each cycle is not known. Other plants attacked to a greater or less extent are prune, quince, peach, plum, wild crab apple, hawthorn, currant, gooseberry, hazelnut, strawberry, alfalfa, alder, maple, loganberry, black walnut, English walnut, and filbert.

Control work has shown the standard spray of lead arsenate 4 lb. to 100 gal. of water before and after blossoming to give a marked reduction in the amount of injured fruit compared with unsprayed fruit. Two sprays give better control than do either of the sprays alone. The first spray after blossoming is the most effective single spray. Two sprays after blossoming are more effective than one spray. For the preblossom spray, lead arsenate combined with a fungicide such as lime-sulfur or Bordeaux mixture does not apparently reduce the effectiveness of the lead arsenate. Dusting appears to be as effective as spraying in *Syneta* control.

Two years experience with *Syneta* beetle control, J. G. HOGG (*Oreg. State Hort. Soc. Ann. Rpt.*, 24 (1932), pp. 21-23).—A brief account of *S. albida*, the most serious enemy of the cherry industry in the Willamette Valley of Oregon,

where it has spread so rapidly in recent years that very few of the orchards are free from it. Reference is made to Oregon Experiment Station Circular of Information 52 (above noted). In control work with dusts, one consisting of 30 parts of powdered arsenate of lead and 70 parts of hydrated lime, applied at the rate of $\frac{3}{4}$ to 1 lb. per tree on April 24, when most of the petals had fallen, and again on May 4 is considered to have given the best results.

A record of winter kill of western pine beetle in California, 1932, J. M. MILLER (*Jour. Forestry*, 31 (1933), No. 4, pp. 443-446).—The author here records the sudden depletion of the western pine beetle population over a large area in the Modoc National Forest, due to a temperature a few degrees below those which normally occur in winter in that region. Following a cold spell in December 1932, 65 percent of the western pine beetle broods were found to be dead.

Temperature extremes as a factor in the ecology of the southern pine beetle, J. A. BEAL (*Jour. Forestry*, 31 (1933), No. 3, pp. 329-336).—The effect of low winter temperature and high summer temperature on the abundance of the southern pine beetle is here considered. Low winter temperatures were often found associated with termination of outbreaks of this pest, while high summer temperatures were effective only in felled exposed logs during part of the summer.

Some preliminary experiments concerning the effects of X-rays on the various stages of the bean weevil, *Bruchus obtectus* Say, G. L. HEY (*Jour. Expt. Zool.*, 64 (1932), No. 1, pp. 209-229, pls. 2, figs. 3).—The author found that, in general, the resistance of the bean weevil to X-rays rises from egg to adult, but no determinations were made to test the resistance of the newly formed pupa.

The alfalfa weevil in Colorado, J. H. NEWTON (*Colorado Sta. Bul.* 399 (1933), pp. 19, pl. 1, figs. 9).—This account deals with the discovery and history of the occurrence of the alfalfa weevil in Colorado, where its presence first became known in the spring of 1917; its host plants; appearance, habits, and life cycle; time and extent of injury; scouting method; dissemination; quarantines; and artificial and natural control. The southwestern counties in the State have remained free thus far but are in constant danger of early infestation, and careful scouting work has failed to reveal its presence in the State east of the Continental Divide. The illustrations include a colored plate showing the annual cycles of the alfalfa weevil and its parasite *Bathyplectes curculionis* Thoms.

Further studies of the physical ecology of the alfalfa weevil, *Hypera postica* (Gyllenhal), H. L. SWEETMAN and J. WEDEMEYER (*Ecology*, 14 (1933), No. 1, pp. 46-60, figs. 5).—In this further contribution from the Wyoming Experiment Station (E.S.R., 67, p. 719), the authors report having found the favorable temperature for oviposition by adults of the alfalfa weevil to be below 28° C. (82.4° F.) with relative humidities between 50 and 95 percent. "Temperatures of 30° to 37° were very injurious, especially when the relative humidity was high, while higher temperatures killed the adults in a few days. Relative humidities below 40 percent, at least with temperatures of 27° or higher, were very destructive to the adults. The favorable region for the hatching of the eggs was between temperatures of about 20° to 30° with relative humidities of 55 to 95 percent. Temperatures of 32° to 34° were unfavorable for percentage of eggs hatching, but the length of the incubation period was very short. Higher temperatures destroyed the embryos. The minimum effective temperature for incubation of the eggs was about 10°. Relative humidities below 40 percent were very destructive to the embryos. The favorable region for larval

development was between temperatures of about 20° to 30° with relative humidities ranging from 95 percent to at least as low as 30 percent. Temperatures above about 34° destroyed the larvae. The minimum effective temperature during the feeding period was near 10°, while that for the pupal period was slightly higher."

The Bremidae of Manitoba, F. NEAVE (*Canad. Jour. Res.*, 8 (1933), No. 1, pp. 62-72, figs. 3).—The author finds that the distributional ranges of many species of bumblebees meet or overlap in Manitoba. The distribution of most of these species is shown to follow closely the summer isotherms, which, in general, run in a northwest to southeast direction. In all, 23 species of bumblebees are reported from the Province.

The biology of parasites and predators of *Laphygma exigua* Huebner reared during the season of 1932, J. W. WILSON (*Fla. Ent.*, 17 (1933), No. 1, pp. 1-15, figs. 10).—The author reports from the Florida Experiment Station upon the predators and fungus parasites of the beet armyworm, which has probably been present in Florida for a number of years but because of its confusion with the southern armyworm was overlooked until the summer of 1932. It is said to be the most important lepidopterous enemy of *Asparagus plumosus* north of Auburndale.

In working on the control and biology of the beet armyworm during the summer of 1932, 8 parasites, 4 hyperparasites, and 2 predators were reared from material collected in the asparagus sheds. In addition to these parasites and predators a fungus disease was present which completely destroyed the infestation of asparagus caterpillars at certain times when the optimum weather conditions prevailed. Of the 8 parasites, *Chelonus texanus* Cress. was the most abundant and the most effective in destroying the larvae of the beet armyworm. Next in importance were *Meteorus autographae* Mues, and *Apanteles marginiventris* (Cress.) found in equal abundance. *Euplectrus platyhy-penae* How. has been observed on several occasions in the ferneries at Leesburg and Pierson, but it was never abundant. At Boynton, however, it was encouraged and was very abundant.

Hyposoter disparis Viereck, an introduced ichneumonid parasite of the gipsy moth, C. F. W. MUESEBECK and D. L. PARKER (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 4, pp. 335-347, figs. 5).—The authors report upon their study of a parasite of the larva of the gipsy moth in Europe, first introduced into the United States in 1907 and first colonized in 1912. Although on rare occasions it has been shown to be a very abundant parasite of the gipsy moth in Europe, particularly in the south central part, it has not as yet become a very important control agent in New England. Its occurrence in Europe, the history of its introduction, colonization, and effectiveness are considered, followed by a description of the adult. Information on its biology and notes on the immature stages are included. The phagocytic reaction of the host as a limiting factor in this parasite's effectiveness is considered. The authors report that from 10 to more than 30 percent of the eggs and young larvae of the parasite dissected from host caterpillars that had been attacked in the laboratory and in the field were found to be dead and surrounded by phagocytes of the host.

Description of a chalcidoid parasite of *Protocalliphora* (Hymenoptera), A. B. GAHAN (*Canad. Ent.*, 65 (1933), No. 2, pp. 31-33, fig. 1).—The author erects the genus *Morodora* and describes *M. armata* n.sp., a chalcidoid parasite reared from pupae of *P. avium* Shan. and Dobr. infesting birds' nests in Montana, as reported by Jellison and Philip (see page 382).

A revision of the Ethiopian species of the genus *Apanteles* (Hym. Bracon.), D. S. WILKINSON (*Ent. Soc. London, Trans.*, 80 (1932), pt. 2, pp.

301-344, pl. 1).—This revision of the parasites of the genus *Apanteles* includes descriptions of 8 species and 1 subspecies new to science, a host list, and keys to the species.

A hymenopterous parasite of the capsid bug *Plagiognathus arbustorum* Fab., G. L. HEY (*Ent. Mo. Mag.*, 3. ser., 19 (1933), No. 218, p. 43).—This is a note on an unidentified braconid parasite of the subfamily Euphorinae.

Five new hymenopterous parasites of the oriental fruit moth, C. F. W. MUESEBECK (*Ent. Soc. Wash. Proc.*, 35 (1933), No. 4, pp. 48-54).—Four braconid parasites of the oriental fruit moth from Japan are described as new, namely: *Bassus diversus*, *Phanerotoma grapholithae*, *Apanteles molestae*, and *Orgilus longiceps*. A single bethylid parasite of the oriental fruit moth from New South Wales, Australia, is also described as new under the name of *Perisierola angulata*.

The birch leaf-mining sawfly, *Fenusa pumila* Klug, R. B. FRIEND (*Connecticut State Sta. Bul.* 348 (1933), pp. 289-364, figs. 24).—Following a brief historical account of this sawfly, its systematic position, and geographical distribution, the author deals at length (pp. 296-330) with its life history and habits in Connecticut, where its occurrence for the first time in this country was discovered in 1923. Its external morphology is then described, followed by control measures, a summary, and a bibliography of 35 titles. A preliminary account of this pest by the author has been noted (E.S.R., 65, p. 59).

There are three generations and sometimes a partial fourth generation in one season in Connecticut. The first adults emerge during the second week in May, and the completion of one summer generation requires about 6 weeks. Eggs are laid in the leaves of gray, white, and European white birches, only the young growing tip leaves being suitable for oviposition. The period of incubation varies from 6 to 13 days, but most of the eggs hatch in 6 to 10 days. The larva mines in the leaf from 8 to 13 days as a rule and then enters the ground to pupate. There are four feeding larval instars and a fifth instar, the prepupal stage, during which the larva is in the cocoon and does not feed.

Pupation occurs in cocoons made of particles of soil at a depth of from 1 to 2 in. below the surface of the ground. The prepupal period averages about 11 days in length in the summer, and hibernation occurs while the insect is in this stage. The pupal period is about 6 days in length. In a small proportion of cases the period in the soil (prepupal plus pupal) is prolonged in the summer to about 45 days. Beginning about the second week in August the insect begins to go into hibernation, and an increasing proportion of prepupae hibernate as the season progresses. The larvae occur in the field until the last of September and the first of October, and a few adults are found as late as the first week in October.

Natural parasitic enemies of this sawfly are not very numerous and do not appear to exert any great degree of control over its abundance, although the influence of natural factors has not been thoroughly investigated. Spraying with nicotine sulfate diluted in water at 1 part in 1,000 will kill the eggs if both sides of the leaves are covered with the insecticide. For the first generation in Connecticut, two applications should be made at weekly intervals beginning about May 25, and for the second generation three applications at weekly intervals are necessary, the first to be made about July 3.

The cholam mite (*Paratetranychus indicus*) on sorghum, M. C. CHERIAN (*Madras Agr. Jour.*, 21 (1933), No. 1, pp. 1-7, pl. 1).—This contribution reports upon observations made of the life history of *P. indicus* and measures for its control on sorghum, which next to paddy is the most important cereal crop in the Madras Presidency.

A note on the occurrence of the Australian cattle tick in Texas, H. O. SCHROEDER, JR. (*Ent. Soc. Wash. Proc.*, 35 (1933), No. 2, pp. 23, 24).—The author records the collection of *Boophilus annulatus australis* Fuller in Texas in the lower Rio Grande Valley counties of Hidalgo and Cameron. In collections made on the Mexican side of the border it was found to be restricted to an area corresponding to its occurrence on the Texas side of the river. Fully 90 percent of the cattle ticks collected at Matamoros, Mexico, were of the Australian variety. This ratio dropped to about 30 percent at Rio Rico, 30 miles farther up the river, and all those collected beyond that point were of *B. annulatus* proper.

Rocky Mountain spotted fever: Investigation of sexual transmission in the wood tick *Dermacentor andersoni*, C. B. PHILIP and R. R. PARKER (*Pub. Health Rpts. [U.S.]*, 48 (1933), No. 11, pp. 266–272).—Experiments conducted at the Rocky Mountain spotted fever laboratory, Hamilton, Mont., have demonstrated that the Rocky Mountain spotted fever virus may be transmitted from infected ticks of one sex to normal individuals of the opposite sex during copulation; also that the virus invades the tissues of the latter and is transmissible during subsequent feeding, just as would happen had the virus been acquired by ingestion or from a parent female. The experiments do not, however, explain the medium by which transfer of the virus is effected, whether by transfer of male or female secretions or by infected sperm.

Relationship between Rocky Mountain spotted fever and “exanthematic typhus of São Paulo”, R. E. DYER (*Pub. Health Rpts. [U.S.]*, 48 (1933), No. 20, pp. 521, 522).—Experiments conducted in which infected ticks (*Amblyomma cajennense*) received from Brazil were fed on and also injected intraperitoneally into guinea pigs have led to the conclusion that the Brazilian disease occurring in São Paulo is identical with Rocky Mountain spotted fever. Guinea pigs immune to spotted fever are immune to the São Paulo virus.

Tick-bite fever in children, P. G. SHIPLEY (*Bul. Johns Hopkins Hosp.*, 51 (1932), No. 2, pp. 83–101, figs. 8).—An account is given dealing particularly with the disease transmitted by the American dog tick as observed in Maryland.

Ticks of the East Indian Archipelago [trans. title], B. J. KRIJGSMAN and S. A. S. PONTO (*Dept. Landb., Nijv. en Handel [Netherland East Indies], Veeartsenijk. Meded.* 79 (1932), pp. 62, pls. 5, figs. 48).—This systematic account of ticks found in the East Indies, of which 30 species are recognized, 2 being new to science, is presented in connection with a list of 32 references to the literature. The distribution of these ticks in the islands is shown by 5 insert maps.

ANIMAL PRODUCTION

Nutritive value of pasture, I–IX (*Jour. Agr. Sci. [England]*, 16 (1926), No. 2, pp. 205–274, figs. 6; 17 (1927), No. 2, pp. 209–263, figs. 2; 18 (1928), No. 2, pp. 266–296; 19 (1929), No. 2, pp. 236–265; 20 (1930), Nos. 1, pp. 53–62; 4, pp. 587–617; 21 (1931), No. 2, pp. 267–323; 22 (1932), Nos. 1, pp. 26–71, figs. 3; 4, pp. 852–873).—This series of investigations was undertaken at the Institute for the Study of Animal Nutrition, Cambridge University, to determine the chemical composition and nutritive value of the herbage of pastures.

I. Seasonal variations in the productivity, botanical and chemical composition, and nutritive value of medium pasturage on a light sandy soil, H. E. Woodman, D. L. Blunt, and J. Stewart.—In this initial paper the results are reported of investigations on the seasonal changes in productivity, botanical and chemical composition, and nutritive value of the grass from a light sandy soil of low water-retaining capacity. Grazing was imitated by the daily use of a mowing machine.

During the spring season soft chess, perennial ryegrass, annual bluegrass, and rough-stalked meadow grass made up about 80 percent of the herbage. As the season advanced soft chess and meadow foxtail disappeared almost entirely, while annual bluegrass diminished considerably. Redtop, which was entirely absent in the spring, showed great activity in the early autumn and formed the bulk of the feed at this season. Rough-stalked meadow grass, perennial ryegrass, and orchard grass persisted satisfactorily throughout the season. White clover flourished and spread under the frequent and close cuttings.

About 22 percent of the season's yield from the pasture was cut from May 11 to May 25. More bulk was produced when a hay crop and aftermath crop were cut than when plats were cut frequently. The frequent cuttings, however, showed a high percentage of protein and a low percentage of fiber as compared with the hay. There was a falling off in protein and an increase in fiber content during the dry season, followed by a recovery in both respects in late summer and early autumn.

The nutritive value of the grass was highest during the early part of the season, followed by a gradual and uniform decline during the dry season. Feeding value recovered progressively after the dry season, until in early autumn the grass was little inferior in this respect to that of the spring grass. Even at the phase of the lowest nutritive value the pasture grass was markedly superior to the best grade of meadow grass.

There was a very definite seasonal variation in the lime and phosphate content of the grass. The lime increased to the maximum in the dry mid-season and then fell off, while the phosphate content showed the opposite behavior.

II. *Seasonal variations in the productivity, botanical and chemical composition, and nutritive value of pasturage on a heavy clay soil*, H. E. Woodman, D. L. Blunt, and J. Stewart.—The work of the previous year was repeated on a stiff clay land and under more favorable conditions of rainfall.

During this season there was a continuous falling off in amounts of such grasses as rough-stalked meadow grass and perennial ryegrass and severe competition from creeping bent, which made up 90 percent of the mown herbage in the later stages of the season. While the frequent cuttings had a favorable effect on white clover, it did not grow as well on the clay soils. It was also thought possible that the spread of creeping bent may have decreased white clover yields.

Due to an abnormally cold, wet spring there was an absence of spring flush in growth, but in spite of this the clay pasture was more productive over the entire season than the sandy pasture. Investigations on composition and yield as compared with hay crops agreed with the results of the previous year.

The results of this test again showed that when conditions with respect to soil, herbage, and weather combined to enable the pasture to make continuous active growth, there was no serious midseason falling off in nutritive value.

The lime content of the herbage in this test was distinctly lower and the phosphorus content slightly higher than in the previous work, and the range in seasonal variation was more restricted.

The lime-phosphate ratio, while attaining a maximum during midseason, did not vary over wide limits, and at no time was seriously unsuited to the mineral requirements of adult animals.

The data concerning the utilization of the protein, lime, and phosphate constituents of the grass by sheep are presented and discussed. The ability of closely grazed pastures, when making up the entire ration, to furnish the lime and phosphate requirements of dairy cows is demonstrated.

III. *The influence of the intensity of grazing on the composition and nutritive value of pasture herbage (Part I)*, H. E. Woodman, D. B. Norman, and J. W. Bee.—The object of this phase of the study was to determine the value of cutting at 2-week instead of weekly intervals on the yield of pastures and on the composition, digestibility, and nutritive value of the herbage.

The results of the two previous experiments showed but little difference in the chemical composition, both organic and inorganic, between the two cuttings of grasses. Digestion trials showed that the dry matter of grass cut at 2-week intervals was equal in digestibility and nutritive value to that of grass cut weekly. These results indicate that pastures after being closely grazed may be permitted to make 2 weeks' unchecked growth before being grazed again without adversely affecting the value of the grass.

The light-land pasture plats under a system of 2-week cutting in 1927 produced 26 percent more dry matter, 29 percent more starch equivalent, and 21 percent more digestible protein than during 1925 when cut at weekly intervals. On the clay-land pastures the difference in productivity was partially due to weather conditions. When weather conditions were favorable to active growth of grass there was little difference in the productivity of the two systems of cutting on this type of land. However, under conditions of drought there was a markedly higher production under the system of cutting at 2-week intervals.

The significance of the results of the investigation in relation to the problem of the conservation of young grass, either dry or as silage, is discussed. A description is also presented of an outstanding case of the lowering of the palatability of pasture herbage due to the conditions of drought.

IV. *The influence of the intensity of grazing on the field, composition and nutritive value of pasture herbage (Part II)*, H. E. Woodman, D. B. Norman, and J. W. Bee.—In this phase of the study the method of cutting was refined to include 3-week intervals.

Cutting at 3-week intervals led to a slight lowering in the percentage of crude protein and a slight increase in the percentages of crude fiber and nitrogen-free extract. No corresponding effect was noted in respect to the ether extract, silica-free ash, lime, and phosphate. The depressing influence of drought on the crude protein content appeared to be more pronounced with grass cut at weekly intervals than with grass cut at 3-week intervals.

There was little difference in the digestibility of grass cut at the various intervals. The depressing effect of drought on digestibility became less pronounced as the intervals between cuttings increased. After 3 weeks' growth grass still retained the nonlignified, highly digestible character possessed by grass cut at weekly and 2-week intervals.

While the grass cut at 3-week intervals contained slightly less digestible protein, it was equal in total digestible organic matter and in starch equivalent to grass cut at shorter intervals, and the dry matter of the grass could still be considered a protein concentrate.

Under the system of cutting at 3-week intervals the herbage did not advance far in maturity and largely retained the leafiness characteristic of young grass in its vegetative and preflowering stages of growth. When plats were grazed closely at 3-week intervals pasture herbage containing a high proportion of creeping bent was not inferior from the standpoint of digestibility to other types of herbage.

The yield of dry matter over the whole season was 29.3 percent more for grass cut at 2-week intervals than for grass cut weekly, while the 3-week intervals yielded 62.3 percent more than the weekly intervals and 25.5 percent more than the 2-week intervals.

V. *Pasture grass conservation: The influence of artificial drying on the digestibility of pasture herbage*, H. E. Woodman, J. W. Bee, and G. Griffith.—Two investigations were undertaken to determine the influence of artificial drying on the digestibility of young leafy herbage. In the first trial grass cut at weekly intervals was dried at the temperature of steam, while in the second trial cuttings were dried by direct heat in a kiln. The digestibility of the nutrients of the grasses was determined with sheep.

The results showed that young grass does not suffer any depression in regard to digestibility when dried by either of the above methods. The high protein content and the highly digestible character of dried young grass is such that it may be used as a substitute for oil cakes for farm animals during the winter.

VI. *The utilization by sheep of mineral-deficient herbage*, H. E. Woodman and R. E. Evans.—The results of this study with sheep led to the belief that the failure of livestock to thrive in mineral-deficient pasture areas could not be explained by assuming that the low mineral content of the grass was responsible for a lack of palatability and a consequent depression of appetite. There was no evidence that the shortage of minerals had any depressing effect upon the digestibility of the grasses. The amount of net energy which ruminants were able to derive from any form of grass appeared to be independent of the mineral content and to depend wholly on the amount and character of the organic constituents.

Malnutrition on mineral-deficient pastures was due directly to the failure of the feed to supply the necessary inorganic materials for the normal functioning of the body.

VII. *The influence of the intensity of grazing on the yield, composition and nutritive value of pasture herbage (Part III)*, H. E. Woodman, D. B. Norman, and M. H. French.—Pasture cuttings in this phase of the study were increased to include a monthly interval.

On a dry matter basis pasture grass cut during April and May contained well over 20 percent of crude protein regardless of the interval between cuttings. During the "flush" of growth, grass cut at monthly intervals contained 18.7 percent of crude protein and 18.8 percent of crude fiber, while the grass cut at weekly intervals contained 23.7 and 16 percent, respectively, of these constituents. It was shown that during a moist, quick-drying season, characterized by greatly enhanced vegetative activity, the amount of ether extract may be depressed to a marked extent, the crude protein to a slight extent, while the crude fiber may be raised considerably. On the basis of the results of this phase of the study, it was concluded that the use of fertilizer was not attended during the first year of application by any important changes in chemical composition of the grass.

Grass cut at monthly intervals was as digestible in the early part of the season as grass cut at shorter intervals. As the season advanced, the effect of the longer interval on digestibility was determined largely by weather conditions, and where these conditions were favorable to quick growth digestibility, including that of fiber, remained as high as under more severe systems of cutting. However, during a season of drought the herbage tended to suffer some degree of lignification and its digestibility was lowered.

The dry matter of monthly-cut grass during April should be regarded as a protein-rich concentrate. During May and June under this system of cutting the nutritive ratio of the herbage widened considerably, and it was concluded that for dairy cows producing more than 5 gal. of milk daily such pastures should be supplemented with a protein concentrate. In the fall the herbage returned to its spring composition.

The monthly system of cutting, reinforced by a suitable system of fertilizing, provided the optimum conditions for the maximum yield of starch equivalent from pastures. Severe drought brought about the following changes in grass cut at monthly intervals: (1) A decided decrease in percentage of protein, (2) a slight increase in nitrogen-free extract and crude fiber, (3) a sharp increase in lime, accompanied by a decrease in phosphoric acid, (4) a pronounced decrease in moisture, and (5) a decided decline in digestibility and nutritive value.

VIII. *The influence of intensive fertilizing on the yield and composition of good permanent pasture (seasons 1 and 2)*, H. E. Woodman and E. J. Underwood.—This phase of the study was designed to determine the effect of periodic applications of sulfate of ammonia on the yield and composition of good permanent pasture, well supplied with reserves of lime, potash, and phosphate.

During the first year of application of sulfate of ammonia there was a slight increase in the crude protein content of the herbage, the most marked effect occurring in April and October. During the second year this improvement was not manifested. This fertilizer had no significant effect on the fiber content of the grasses. The sulfate of ammonia had a slightly depressing effect on the lime content, which was more marked in the second season, had no effect on phosphate, and enabled the herbage to maintain a high level of potash during the drought season. During the first season the fertilizer brought about a small increase in the percentage of chlorine, but had no such influence during the second season. No significant effect on the soda content of the herbage was noted.

Over a 2-year period the plats receiving sulfate of ammonia yielded 49.6 lb. more nitrogen per acre than the plats receiving the basal treatment only. The outstanding effect of sulfate of ammonia was the production of an essentially grassy type of herbage and the marked discouragement of weeds.

IX. *The influence of the intensity of grazing on the yield, composition and nutritive value of pasture herbage (Part IV)*, H. E. WOODMAN and D. B. NORMAN.—In this phase of the study the interval between successive cuts was lengthened to 5 weeks to determine the consequences of adopting in actual practice a 5-week rotational close-grazing system.

This method of cutting led to a definite, though not serious, reduction in the digestibility of the herbage, which was most noticeable during the flush period of growth. The constituent most affected was the crude protein. During a season of favorable rainfall this method of cutting prevented the herbage from becoming lignified and of greatly reduced digestibility, but during a season of drought there was a possibility of premature lignification where this system was followed. During April the herbage had a protein-concentrate nature similar to herbage mowed at shorter intervals, but during the flush period of growth there was a considerable drop in respect to the digestible protein. Beginning in July the digestible protein content began to increase again. A review of these results showed that during the quick-growing season pasture grass under a 5-week rotational close-grazing system had a slightly lower feeding value than grass grazed down at monthly intervals, but that as the season progressed the nutritive value of the two systems of grazing tended to become equal.

The dry matter of the herbage mowed at 5-week intervals contained on the average over the entire season 63.9 percent of starch equivalent, including 12.6 percent of digestible protein. Such grass, even in periods of lowest mineral content, had sufficient lime and phosphate to meet the requirements of dairy cattle.

The American Society of Animal Production: Record of proceedings of the twenty-fifth annual meeting, November 25–26, 1932 (Amer. Soc.

Anim. Prod. Proc. 1932, pp. 412, figs. 18).—This is the report of the annual meeting held at Chicago, November 25 and 26, 1932 (E.S.R., 68, p. 227). The following papers were presented in the cattle, horse, swine, sheep and wool, nutrition, and meats sections:

Public Aid for Livestock Breeders, by J. A. Hill (pp. 9-14); The Use of Statistical Methods in Animal Husbandry, by J. L. Lush (pp. 15-19); The Use of Simple Statistical Methods in Nutrition Investigations, by L. A. Maynard and C. M. McCay (pp. 20-24); An Improved Design for Experiments with Groups of Animals Whose Outcome May be Estimated, by G. W. Snedecor and C. C. Culbertson (pp. 25-28); Results of Tests of Illinois Farm Scales, by R. C. Ashby (pp. 29-31); Net Energy of Completely Balanced Nutriment as a Measure of Nutritive Value of Rations and of Nutritive Requirements of Animals, by E. B. Forbes (pp. 32-40); Evaluating Beef Cattle Performance for a Register of Merit, by E. W. Sheets (pp. 41-47); Livestock Records of Performance and Their Value to the Meat Industry, by E. N. Wentworth (pp. 48-51); Show Ring Winnings as a Means of Evaluating Sires, by J. C. Holbert (pp. 52-55); Fattening Cattle of Different Market Grades, by W. H. Peters (pp. 56-59); Ground Limestone for Fattening Cattle, by C. W. McCampbell (pp. 60-62); Baby Beef and What It Means to the Laity, by E. S. Good (pp. 63, 64); Tankage in the Fattening Cattle Ration, by P. Gerlaugh (pp. 65-67); Machine Dried versus Field Cured Soybean Hay for Beef Steers, by M. G. Snell (pp. 67-69); Studies on Producing Lower Cost Silage, by F. R. Edwards (pp. 70, 71); Minerals for Range Cattle, by J. L. Lantow (pp. 71, 72); Value of a Brahman Cross on Native and Grade Beef Cattle in Southern Louisiana, by C. I. Bray (pp. 72-76); A Comparison of Body Measurements of Beef and Dual Purpose Cattle, by B. Knapp, Jr., and A. C. Cook (pp. 77-84); The Relation of Dietary Fat and Fat Derivatives in the Feces of Dairy Calves, by C. Y. Cannon, D. L. Espe, and J. B. Waide, Jr. (pp. 85-90); The Chemical Composition of Early Pasture Legumes and Grasses, by R. H. Lush (pp. 91-94); Seasonal Variation in Composition and Digestibility of Certain Species of Range Bunch Grasses, by R. McCall (pp. 95-100); Cottonseed Products for Fattening Calves, by W. L. Blizzard (p. 101); The Use of Oat Feed as the Entire Ration for Horses at Light to Medium Work, by A. W. Lathrop and G. Bohstedt (pp. 102-104); Strongyle Infestation in Horses, by R. Graham (pp. 105-109); Blackstrap Molasses as a Feed for Louisiana Work Mules, by M. G. Snell and W. G. Taggart (pp. 110-112); Feeding Draft Colts, by R. S. Hudson (pp. 113-115); What Type of Horses Should the Corn Belt Farmers Produce and Use? by J. L. Edmonds (p. 115); Equipment Employed in Studying the Calcium, Phosphorus, and Nitrogen Metabolism of Draft Horses, by B. H. Thomas and A. L. Harvey (p. 115); Horse Extension Activities in the Buckeye State, by L. P. McCann (pp. 116-118); Demonstrating Big-Team Outfits, by E. T. Robbins (pp. 118-122); A National View of Extension Work in Horse Husbandry, by W. Dinsmore (pp. 123-126); The Nutritive Value of Soybeans with Preliminary Observations on the Quality of Pork Produced, by C. M. Vestal and C. L. Shrewsbury (pp. 127-130); Wheat and Soybeans as a Feed for Swine, by A. E. Tomhave (pp. 131-133); Production Tests for Selection of Breeding Hogs, by E. F. Ferrin (pp. 134-137); The Optimum Degree of Fineness of Grinding Corn for Growing and Fattening Swine, by M. A. McCarty and J. E. Nicholas (pp. 138-140); Anemia in Suckling Pigs, by J. P. Willman, C. M. McCay, and F. B. Morrison (pp. 141-145); Preliminary Results from Grinding Barley and Wheat for Pigs, by V. A. Freeman (pp. 146, 147); Fattening Pigs on Small Grains, by T. Wright (pp. 148-150); The Use of Slacked Coal and Charcoal in Swine Feeding, by C. P. Thompson (p. 150); Sodium Bicarbonate at Different Levels for Growing Gilts on Pasture, by A. L. Anderson, C. C.

Culbertson, J. M. Evvard, and W. E. Hammond (pp. 151-154); Dried Caplin Fish Compared with Tankage as a Protein Supplement for Swine, by W. C. Skelley (pp. 155, 156); Value of Permanent Pasture for Fattening Pigs, by E. H. Hostetler (pp. 157, 158); A Comparison of Some Southern Protein Supplements for Fattening Swine, by Z. A. Massey (pp. 158, 159); Sweet Potatoes for Swine, by C. I. Bray (pp. 160-164); Rice Polish for Growing and Fattening Swine, by E. Martin (pp. 164-169); Some Observations on Pigs Receiving Vitamin A Deficient Rations, by J. H. Longwell and C. E. Weakley, Jr. (pp. 169-173); The Influence of Nutrition on the Oestrous Cycle in the Ewe, by A. E. Darlow and L. E. Hawkins (pp. 173-176); Experiments with Timothy Hay for Pregnant and Nursing Ewes, by D. S. Bell, L. E. Thatcher, and C. H. Hunt (pp. 176-180); The Effect of Early Breeding on Ewes, by D. J. Griswold (pp. 181-183); Making Sweet Clover Pastures Available Earlier in the Spring, by C. W. Hickman and J. E. Nordby (pp. 184, 185); Safe and Economical Ways of Self-feeding Lambs, by G. Bohstedt (pp. 185-187); The Need of New Units of Measurement in Wool Research, by J. F. Wilson (pp. 187-189); Market Grades of Lambs, by W. A. Netsch (p. 189); Lamb Feeding Investigations at Washington State, by H. Hackedorn (pp. 190-192); A Move toward Registry of Merit for Rambouillet Sheep, by D. A. Spencer (pp. 193-197); Discussion, by F. S. Hultz (pp. 198-200); Biological Values of the Proteins, Digestion Coefficients of Organic Nutrients, and Calcium and Phosphorus Balances of Lamb Rations Consisting of Alfalfa Leaves and Stems, by J. Sotola (pp. 200-204); The Efficacy of Copper in the Regeneration of Hemoglobin in Anemic Lambs, by B. H. Thomas and S. S. Wheeler (pp. 204-208); Function of Minerals in Nutrition, by R. B. Becker (pp. 291-297); Under What Conditions Are Calcium and Phosphorus Supplements Needed in the Feeding of Farm Animals, by G. Bohstedt (pp. 298-302); The Value of Different Calcium Supplements in Animal Feeding, by L. A. Maynard (pp. 303-308); The Effect of Vitamin D and Irradiation on the Utilization of Calcium and Phosphorus, by R. M. Bethke (pp. 309-316); Under What Conditions Are Mineral Supplements Other Than Salts of Calcium and Phosphorus Necessary in Feeding Farm Animals, by T. S. Hamilton (pp. 317-343); The Nutritive Requirements of the Dairy Cow Expressed in Accord with a New Method of Application of the Net-Energy Conception: A Correction, by E. B. Forbes and M. Kriss (pp. 344, 345); A Practical Method of Measuring Color in Beef, by D. L. Mackintosh (pp. 345-353); Differences between Barrows and Gilts in the Proportion of Pork Cuts, by M. D. Lacy (pp. 354-357); Some Relationships among Factors in the Production and Grade of Beef, by O. G. Hankins and L. B. Burk (pp. 358-364); Meat Production, Distribution, and Consumption, by W. W. Woods (p. 364); and Influence of Cooking and Canning on the Vitamin B Content of Beef and Pork, by F. W. Christensen, E. Latzke, and T. H. Hopper (pp. 365-368).

[**Animal husbandry experiments at the New Hampshire Station**] (*New Hampshire Sta. Bul.* 270 (1933), pp. 5, 6, 19-21).—Data are reported from a comparison made by E. G. Ritzman and F. G. Benedict of the nutritive value and digestibility of timothy hay cut before bloom, during early bloom, and after the formation of seed; studies by Ritzman of metabolism in the horse and the basal energy requirements of two Berkshire sows; and studies by A. E. Tepper, T. B. Charles, and F. D. Reed on the use of high protein rations in battery brooding of chicks, the value of soybean meal for chick feeding, yellow corn meal and alfalfa meal as sources of vitamin A, and the effect of high battery brooding temperatures.

[**Experiments in animal production at the Union Substation**] (*Oregon Sta., Oregon Livestock Branch Sta. [Pamphlet, 1933], pp. 3-6, figs. 2*).—Brief

reports are given of the results of experiments conducted on wintering beef cows on straw and alfalfa hay, the feeding of baby beeves on cut and long alfalfa hay with barley and wheat rations, the shrinkage of baby beef calves shipped from Union to Portland, the influence of exercise on ewes, and winter rations including alfalfa hay for brood sows.

Growth and development with special reference to domestic animals.—XXVI, The energy increment of standing over lying and the cost of getting up and lying down in growing ruminants (cattle and sheep); comparison of pulse rate, respiration rate, tidal air, and minute volume of pulmonary ventilation during lying and standing, W. C. HALL and S. BRODY (*Missouri Sta. Res. Bul.* 180 (1933), pp. 31, figs. 4).—Continuing this series of studies (E.S.R., 69, p. 94), data are presented on the energy metabolism, as determined by the closed-circuit oxygen-consumption method previously described (E.S.R., 63, p. 760), of Guernsey, Jersey, Holstein, and Hereford cows, a Hereford steer, Holstein and Hereford heifer calves, and Dorset ewes. The tests were conducted on trained animals. The percentage energy increment for standing as compared with lying was calculated at about 9 percent for dairy cattle and Dorset sheep, 7 percent for a Hereford cow, and 13 percent for a fat Hereford steer. In addition to the averages of 1,989 measurements of the energy metabolism of these animals, the data are presented to show the heat measurements by weight and surface area and pulse rate, respiration rate, tidal air, and pulmonary ventilation during lying and standing. Both the rate and amount of air breathed in and out of a unit of time and per respiration and pulse rate were found to vary with the condition of the animal as to lying, standing, getting up, or lying down, fasting, etc. Statistical constants are presented for the measurements on each group of animals.

The periods of embryonic growth in cattle, D. A. KISLOVSKY and B. A. LARCHIN (*Jour. Agr. Sci. [England]*, 21 (1931), No. 4, pp. 659–668, figs. 3).—A study was made of 15 calf embryos ranging in age from 40 to 270 days by the Department of Animal Breeding, Institute of Dairy Farming, U.S.S.R. The embryos were obtained from Domshino cattle and were weighed and measured immediately after the cows were slaughtered.

The preliminary results in this study demonstrated that there are, beginning 40 days after conception, five periods of growth in the calf during the self-accelerating phase of growth. The periods differ in length in various breeds. Some breeds, such as the highly developed dairy breeds, pass the last break in rate of growth before birth, while other breeds sometimes have as many as two such breaks after birth.

The effect on the foetus and milk and beef production of the removal and transplantation of the ovaries of large mammals, M. MANRESA (*Univ. Philippines, Nat. and Appl. Sci. Bul.*, 2 (1932), No. 2–3, pp. 149–161, fig. 1).—The results of a study at the College of Agriculture, University of the Philippines, showed that the complete removal of the ovaries from pregnant cattle was followed by abortion. Ovariectomy prolonged the period of laceration and caused a marked increase in the total amount of milk produced. It was not determined whether the operation increased the rate of milk flow.

Spayed females lost their feminine appearance and approached castrated males in disposition and in general physical condition. The body weight, dressing percentage, and quality of beef of female cattle were favorably affected by spaying. It was concluded that for cattle and carabaos spaying offered a practical means for the elimination of old and inferior animals.

Wheat as a fattening feed for cattle, A. D. WEBER and W. E. CONNELL (*Kansas Sta. Bul.* 261 (1932), pp. 20).—Following the presentation of a sum-

mary of experiments in which wheat was fed to cattle, the results of two series of experiments are reported in which wheat was compared with shelled corn for finishing 80 yearling steers in a 180-day test. There were four lots in each series, averaging from 604 to 620 lb. in live weight. All received cottonseed meal and alfalfa hay, and sorghum silage also was fed in the first series. In addition to these feeds lot 1 received ground shelled corn; lot 2, a mixture of ground shelled corn and ground wheat 2:1; lot 3, ground shelled corn and ground wheat 1:2; and lot 4, ground wheat.

The results showed that all lots made average daily gains of more than 2.2 lb. Wheat was thus a very efficient producer of gains, but it was less palatable than ground corn when fed alone. The mixtures of wheat and corn proved equivalent to corn alone. The carcasses of the steers fed wheat as the sole grain did not grade as high as those receiving corn alone, but those receiving corn and wheat 1:2 produced carcasses equal to the steers fed on corn as the sole grain ration.

A note on Wood and Capstick's method of calculating the maintenance requirements of the adult sheep, W. A. HENDRICKS and H. W. TITUS (*Jour. Agr. Sci. [England]*, 21 (1931), No. 4, pp. 726-738, figs. 2).—In the course of studies relating to the maintenance requirements of chicks at the U.S.D.A. Animal Husbandry Experiment Farm, Beltsville, Md., the authors became interested in and made a study of the maintenance requirement of adult sheep as calculated by Wood and Capstick (*E.S.R.*, 57, p. 68).

The analysis of Wood and Capstick's data showed that when the range in live weight of the experimental animals is small there is little justification for attempting to refine the calculations by assuming proportionality between the maintenance requirement and the two-thirds power of the live weight of the animal. While the maintenance requirement of an animal is affected by its surface area, small differences may be obscured by the effects of other factors contributing maintenance requirement.

It is believed that the level of feed intake as well as the size and activity of the animal influence to some extent the maintenance requirement. When the range in live weight of experimental animals is small, the effects of all factors contributing to maintenance may be such that the higher maintenance requirements tend to be associated with the lower live weights. It is also considered possible that the lack of proportionality between maintenance requirement and the two-thirds power of the live weight was due to the fact that the surface area is, in some cases, not proportional to the two-thirds power of the live weight. When animals are not uniform in condition, heavier animals need not have a correspondingly greater surface area than lighter animals. The chemical composition of gains and losses in live weight largely determine the amount of feed to which they are equivalent, and these chemical changes in live weight are dependent to some extent upon the condition of the animal.

The care, feeding, and management of sheep, P. S. SHEARER (*Iowa Sta. Circ.* 138 (1932), pp. 31, figs. 18).—A popular account of the sheep industry in Iowa, including discussions of breeds, methods of feeding, breeding, and management of sheep, and control of common diseases and parasites.

Sheep feeding, W. C. SKELLEY (*New Jersey Stas. Circ.* 277 (1933), pp. 4).—A brief discussion of feeds and suggested rations for sheep.

Hogging-off corn and sweet potatoes and feeding cull sweet potatoes to hogs, C. I. BRAY and J. B. FRANCONI, JR. (*Louisiana Stas. Bul.* 236 (1933), pp. 39, figs. 4).—In two experiments hogging-off corn and soybeans was compared with dry lot feeding of corn. Supplements of shrimp meal, cottonseed meal, and rice polish in one case and alfalfa hay as a substitute for the rice polish in

the other were provided. The pigs fed the first year for 45 days made average daily gains of 1.2 lb., but in the second experiment hogging-off corn and soybeans produced average daily gains in a 33-day test of 1.5 lb. as compared with 1.4 lb., the average daily gains produced by hogs fed in dry lot. Good returns were calculated for the corn and soybeans hogged off.

The results of six experiments conducted over a period of 5 years, in which sweetpotatoes were compared with corn in field tests and in the dry lot, where more accurate determinations of the feed consumption could be made, are briefly reported. The combined results demonstrate the importance of adding a protein concentrate to the sweetpotato rations, although soybeans hogged off and sweetpotato vines had important supplemental value. The number of pounds of sweetpotatoes equivalent to 1 lb. of concentrates was calculated under the following feeding conditions: As sweetpotatoes fed alone, 10.4; when fed with a protein supplement in dry lot, 7.7; when hogged off in the field and additional protein supplements provided, 4.9; and when fed with corn and protein supplement in dry lot, 4.3 lb. Thus about 30 bu. of sweetpotatoes fed with a protein supplement were required per 100 lb. of gain.

The influence of maize germ on the quality of bacon, C. CROWTHER (*Jour. Min. Agr. [Gt. Brit.], 39 (1932), No. 5, pp. 428-440*).—A series of tests was undertaken at the Animal Nutrition Research Institute, Cambridge, the Harper Adams Pig Feeding Experimental Station, and the Chemical Research Division of the Ministry of Agriculture for Northern Ireland to determine the value of degermed maize for feeding to bacon hogs. The feeding scheme consisted of four lots of pigs fed either flaked yellow maize (including germ), flaked yellow maize (degermed), raw yellow maize meal (including germ), or flaked white maize (degermed). However, it was possible at only one of the stations to provide all the lots.

The results as a whole showed that degermed maize produced a better quality of bacon than ordinary maize meal containing the germ. That the nutritive value of the maize was not impaired by the removal of the germ was shown by the comparable gains in live weight in all the lots. The relatively small differences in the quality of the bacon suggested that the importance of the food-oil factor in determining quality has been exaggerated. The results also suggested that the changes brought about in the maize by cooking, as in the preparation of flaked maize, may have a separate influence upon quality, as may also inherited characteristics of the pigs themselves.

The composition of mare's milk, R. G. LINTON (*Jour. Agr. Sci. [England], 21 (1931), No. 4, pp. 669-688*).—Samples of milk from 142 mares were analyzed at the Royal Veterinary College, Edinburgh, to determine the content of solids, protein, fat, lactose, and ash as compared with previously reported analyses. Of the total samples, 38 were taken during the period of colostrum secretion.

The average ash content of the milk of British mares was 0.51 percent as compared with an average of 0.38 percent for continental mares. With the lighter British breeds the ash content was similar to that of continental mares. There were no other marked differences in the composition of the milk of British and continental mares.

Analyses of the milk from mares whose foals were not thriving showed the milk to be abnormal in practically all cases. The occurrence of oestrus commonly caused nutritional disturbances in the suckling foal. Milk with a high percentage of fat was unsuitable for foals, and they appeared to thrive well when the milk contained very little fat. The lactose of mare's milk was fairly constant and a slight excess did not appear to be harmful, but foals did not thrive well when the milk contained much less lactose than the normal amount. Aged mares either secreted milk of normal composition or milk with

a tendency toward richness. The colostrum of mares had the same characteristics as that of cows.

[Poultry experiments at the Maine Station] (*Maine Sta. Bul.* 363 (1932), pp. 247-250, figs. 2).—The results of studies are reported by W. F. Dove dealing with the influence of different methods of drying on the vitamin D and protein value of dried Maine sardines and whitefish and with the influence of red light on the action of antirachitic substances in poultry rations.

Experimental errors in chicken-raising experiments, R. W. HALE (*Jour. Agr. Sci. [England]*, 21 (1931), No. 4, pp. 716-725, fig. 1).—Experiments designed to compare different rations and methods of management as regards their effect on the rate of growth of chickens and on the subsequent laying power and weight of the pullets were conducted at the Agricultural Research Institute of Northern Ireland. The study covered two seasons and involved 45 groups of from 30 to 100 chicks each.

It was concluded that the weights of cockerels and pullets should not show a standard deviation much greater than 15 percent of the mean weight for the group, unless the experimental treatment or other conditions have seriously interfered with the rate of growth. A comparison of mean weights and of standard deviations may be misleading unless cockerels and pullets are considered separately.

The author has tabulated the smallest significant differences between the mean weights of groups for standard deviations of 15, 17.5, and 20 percent and for groups of from 10 to 100 birds.

The efficiency of New Orleans sunshine in preventing leg weakness and promoting growth in chicks, H. S. MAYERSON and H. LAURENS (*Poultry Sci.*, 11 (1932) No. 6, pp. 325-334).—A study was undertaken with 2-day-old chicks to determine whether the antirachitic wave lengths of sunlight would be absorbed or diminished in their passage through the atmosphere at the low elevation and under the semitropical conditions of New Orleans. In addition to exposing chicks to direct sunshine and skyshine (reflected radiation from sky and clouds), other groups were kept under Vitaglass, Corex D, and Cel-O-Glass. The same basal ration was fed to all lots. The positive control lot received 2 percent of cod-liver oil in addition, while the negative control lot received the basal ration only. Each test was conducted for 6 weeks, and the chicks were weighed weekly. At 8 weeks of age the chicks were X-rayed, killed, and the blood pooled for the determination of serum calcium and phosphorus.

Observations covering a period of 27 months showed that average daily exposures of about 2 minutes to sunshine during July, August, and September; of between 2 and 3 minutes during April, May, June, and October; of 5 minutes during November, December, and January; and of from 3 to 5 minutes during February and March prevented the appearance of leg weakness and promoted normal growth in chicks on vitamin D deficient diet. With skyshine average daily exposures of from 6 to 11.4 minutes from July through October; of 35 minutes from November through February; and of from 18 to 19 minutes from March through June were necessary for normal calcification and growth. Chicks exposed under Vitaglass, Corex D, and Cel-O-Glass to sunshine were protected from rickets throughout the year by exposures correspondingly greater in proportion to the relative absorption of these materials.

The minimum amount of solar energy of wave lengths shorter than $313\text{ m}\mu$, effective in preventing leg weakness, was found to be approximately 0.00069 g calories per square centimeter ($48.3\text{ }\mu\text{w}$) daily. Measurement of the additional skyshine to which chicks were exposed showed that a total radiation of wave lengths shorter than $313\text{ m}\mu$ from sun to sky equivalent to approximately

0.00134 g calories per square centimeter (99.8 μ w) daily produced proper calcification and growth.

Salt tolerance of baby chicks, G. D. QUIGLEY and R. H. WAITE (*Maryland Sta. Bul.* 340 (1932), pp. 343-370, figs. 18).—In a test of the effect of different amounts of salt in the ration of chicks, six lots of 14 chicks each were fed mash rations containing 1, 3, 5, 8, 10, and 15 percent of salt, respectively. Up to 9 weeks of age mortality was not excessive until the level of salt in the ration was 8 percent or above. The rations containing the larger amounts of salt were unpalatable and interfered with growth because of reduced feed consumption, but caused no permanent injury. Large amounts of water were consumed, and the feces were watery when excessive amounts of salt were included in the ration.

Studies of the tolerance of other groups of 90 chicks to large single doses showed that the minimum lethal dose was about 4 g of salt per kilogram of live weight. A somewhat larger total dose was tolerated if it was divided and administered at 4-hour intervals.

Chicks dying from salt poisoning showed a large hemorrhage at the base of the heart, severe bloody congestion of the kidneys, and a more or less slimy appearance of the lining of the proventriculus, gizzard, and intestine. Histological examination of various tissues of the birds, by E. Bray, showed no striking abnormalities, but difficulty was encountered in fixing and sectioning the kidney tissue of the affected birds.

Curved-line relationships between certain short-period egg yields and annual egg production in Single-Comb White Leghorn fowls, W. C. THOMPSON (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 4, pp. 349-359, figs. 3).—Based on a study at the New Jersey Experiment Stations of the egg production records of 3,937 birds in three egg-laying contests conducted over a period of two years, relationships were calculated between the total annual egg production, the winter egg production during the period October 1 to January 28, the late-summer egg production during the 30 days August 25 to September 23, and the winter plus the late-summer production.

The linear correlations calculated between total annual production and winter yields were 0.6352 ± 0.0064 and total annual production and winter plus late-summer egg production 0.6711 ± 0.0088 . The curvilinear correlations between these variables were, respectively, 0.6641 ± 0.0033 and 0.7150 ± 0.0078 . The linear regression equations calculated between annual and winter egg production were $Y \text{ (annual)} = 1.553 X \text{ (winter)} + 115.032 \pm 30.8435$ and annual egg production with winter plus late-summer production $Y \text{ (annual)} = 0.8138 X \text{ (winter plus late-summer)} + 153.2667 \pm 28.4184$. Partial correlations between total and winter egg production with later-summer production held constant were also calculated. On account of the curvilinear relationship existing between the variables as determined by the Blakeman test, a slight improvement in the prediction value was obtained by use of a logarithmic regression equation.

Poultry breeding, M. A. JULL (*New York: John Wiley & Sons; London: Chapman & Hall*, 1932, pp. XIV+376, figs. 71).—Breeding practices that should be followed in order to increase the average production of the poultry flock are discussed. The fundamental principles of inheritance are explained so that the breeder may have a clearer understanding of the method in which characters of economic importance are transmitted from parent to offspring. The value of progeny testing as a means of determining progress is also explained.

Turkey growing trials (*Oregon Sta., Umatilla Branch Sta. [Pamphlet, 1933], p. [6], fig. 1*).—A comparison was made of the supplemental value of green feeds and protein mash for growing turkeys.

DAIRY FARMING—DAIRYING

Proceedings of the 27th annual meeting of the American Dairy Science Association (*Jour. Dairy Sci., 15 (1932), No. 6, pp. 489-497*).—A brief résumé of the meeting held at the University of Kentucky from June 28 to 30, 1932, together with the titles of papers presented in the various sections of the association (*E.S.R., 67, p. 165*).

A study of the effects of alfalfa hay and irrigated pasture on growth of Holstein heifers, H. S. WILLARD (*Jour. Dairy Sci., 15 (1932), No. 6, pp. 435-444, figs. 2*).—In a study at the Wyoming Experiment Station 20 Holstein heifers, varying in age from 6 to 24 months, were divided into two lots. During the winter lot 1 received alfalfa hay as the only feed, while lot 2 received alfalfa hay plus 2 lb. of ground barley per head daily. In summer both lots were run on irrigated sweetclover and tame grass pasture without additional feed.

During the winter months lot 1 made average monthly gains of 28.5 lb. while lot 2 gained 32 lb. The older heifers made larger gains in lot 1 than the younger heifers. The average monthly gains for all heifers in both lots while on pasture was 40.6 lb. While the heifers that received grain during the winter made somewhat larger gains on pasture than those that had received alfalfa alone, little significance was attached to this fact because of the limited number of animals and also because lot 1 made very satisfactory gains during the winter. The two groups were about the same size at 27 months.

The successful growth of heifers raised without grain in this test was attributed to two facts: (1) That the animals were of sufficient size at 12 months of age to consume enough roughage for desirable growth, and (2) the possible beneficial effect of irrigated pasture.

The control of pastures on some farms in Finland (Suomi) in the summer of 1931 [trans. title], C. A. G. CHARPENTIER ([*Finland*] *Valtion Maatalouskoetoiminnan Julkaisu. No. 49 (1932), pp. 104, Swed. and Eng. abs., pp. 75-84*).—Continuing these studies (*E.S.R., 68, p. 84*), the yield on the forest pastures increased somewhat in comparison with the previous year. The yield on cultivated pastures on wooded lands was somewhat smaller, while the yield on arable land pastures decreased 200 fodder units per hectare as compared with the previous year. On the arable land pastures there was an average production of 1,787 kg of milk and an average increase in weight of 65 kg per hectare.

Spring-calving cows gained from 8 to 467 g per day, autumn-calving cows 54 to 453 g, winter-calving cows 42 to 456 g, pregnant heifers 189 to 671 g, and 1- to 2-year-old heifers from 324 to 584 g per head daily. The spring-calving cows produced from 6.5 to 18.8 kg of milk, autumn-calving cows 2.3 to 11 kg, and winter-calving cows from 5.5 to 12.5 kg of milk per day. The fodder consumption in fodder units per head per day was for spring-calving cows from 4.9 to 11.4, autumn-calving cows 3 to 9.4, winter-calving cows 3.8 to 9.7, pregnant heifers 2.7 to 5, 1- to 2-year-old heifers 2.2 to 5, and calves 2.2 to 3.4. The cost per fodder unit of pasture was somewhat lower in 1931 than in the previous year, due to the lower fertilizer costs.

Vitamin A content of pasture plants.—I, White clover (*Trifolium repens*) and Kentucky blue grass (*Poa pratensis*) under pasturage conditions and fed green, E. WOODS, A. O. SHAW, F. W. ATKESON, and R. F. JOHNSON (*Jour. Dairy Sci., 15 (1932), No. 6, pp. 475-479, fig. 1*).—In a prelim-

inary study at the Idaho Experiment Station the technic of Sherman and Mossell (E.S.R., 54, p. 89) was used for determining the vitamin A content of some pasture plants. After the experimental rats used had been depleted of vitamin A, each of the above plants was fed at levels of 60, 180, and 600 mg per week.

The results indicated that white clover contained at least 200 units of vitamin A, and that bluegrass had about 100 units. On the basis of these results, white clover is one of the best sources of vitamin A and bluegrass ranks with the best dried alfalfa.

Sudan grass as hay, silage, and pasture for dairy cattle, J. R. DAWSON, R. R. GRAVES, and A. G. VAN HORN (*U.S. Dept. Agr., Tech. Bul. 352 (1933), pp. 28, figs. 2*).—Data are presented on the yields and feeding value for dairy cattle of Sudan grass as hay, silage, and pasture in studies conducted at the Woodward, Okla., Dairy Experiment Station from 1928 to 1931. The average yields of air-dry hay per acre when cut at different stages of growth were 4,033 lb. for hay cut when first heading, 3,925 lb. when fully headed, and 3,922 lb. when cut in the soft-dough stage. The yields obtained from cuttings at 30-day intervals were largely dependent upon the distribution of the rainfall over the season.

The chemical composition of the hay was closely correlated with the maturity of the plant and the rainfall. The percentage of protein and fat was depressed and the nitrogen-free extract increased as the days of growth increased. The yield of crude protein per acre was greatest in the early-cut Sudan. In 2 years' feeding tests the hay cut when first heading was most palatable. The hay and Sudan silage gave satisfactory milk production and maintained milk yields in a relatively good manner. Sudan was also a very good pasture crop for cattle, but 33 percent more nutrients were produced per acre from Sudan grass hay when first heading than from Sudan pasture.

The economy of conversion of food energy into milk energy by the dairy cow, E. B. FORBES and L. VORIS (*Jour. Nutrition, 5 (1932), No. 4, pp. 395-401*).—At the Pennsylvania Institute of Animal Nutrition it was found that nine Holstein cows with an average live weight of 520.8 kg (1,146 lb.) and an average milk production for one lactation period of 5,356 kg, transformed approximately 21 percent of their feed energy into milk energy during the period of 313 days. The most efficient cow converted 23.4 percent and the least efficient cow 18 percent of the feed energy into milk energy during this period.

The hemoglobin content of the blood of healthy and anemic "salt-sick" cattle, W. M. NEAL and R. B. BECKER (*Jour. Agr. Res. [U.S.], 46 (1933), No. 6, pp. 557-563*).—Determinations at 2.5-hour intervals of the hemoglobin by the Newcomer acid-hematin method of blood samples of 10 normal Jersey heifers and dry cows at the Florida Experiment Station averaged 13.27 g of hemoglobin per 100 cc with a standard deviation of ± 0.162 g. Considerable individual variation was evident in animals bled on successive days and at different intervals. There was evidence, however, that the concentrations of hemoglobin were higher and more regular in blood samples drawn during the early afternoon and early forenoon. Hemoglobin determinations on cattle from 39 herds exhibiting more or less nutritional anemia showed that the hemoglobin content of the blood of anemic animals was considerably lower than in normal animals. In 87 head visibly affected the average was 8.28 g of hemoglobin per 100 cc of blood. The lowest value observed was 1.37 g in a calf shortly prior to death. An animal exhibiting anemia which recovered on supplements of iron and copper showed the presence of 3.02 g of hemoglobin per 100 cc of blood. Others ranging above this amount showed recovery when the iron and copper supplements were fed.

Plasma phosphatase in dairy cows suffering from fluorosis, P. H. PHILLIPS (*Science*, 76 (1932), No. 1967, pp. 239, 240).—Because it seemed possible that a change in plasma phosphatase might be a means of detecting chronic fluorine poisoning, six lots of three heifers were fed rations balanced as to protein and containing ample energy at the Wisconsin Experiment Station. Three of the lots received no known source of fluorine, while the other lots received approximately 0.02, 0.04, and 0.087 percent of the grain ration as fluorine fed as a mineral supplement in the form of raw rock phosphate. Blood samples were taken during the first lactation as follows: (1) Prior to parturition, (2) near the peak of production, (3) mid-lactation or later, and (4) near the end of lactation.

There was a definite gradation in the plasma phosphatase between lots and a progressive rise in plasma phosphatase in the high-fluorine lot accompanying the progressive severity of the poisoning as expressed in the gross symptoms of the animals. These changes were in all likelihood due to the increased grain required to meet the needs of lactation and the subsequent higher fluorine intake. The plasma phosphatase values in the high fluorine lots at the respective stages were 0.2787, 0.3142, 0.3537, and 0.4227 units per cubic centimeter. It was concluded that in the absence of other bone diseases plasma phosphatase in fluorosis is a sensitive test for the toxic effects of chronic fluorine poisoning.

The heat production of cattle in a respiration calorimeter as related to the rate of ventilation and to the moisture content of the air, E. B. FORBES, W. W. BRAMAN, and M. KRISS (*Jour. Nutrition*, 5 (1932), No. 4, pp. 387–394).—The heat production of a dry cow, on a constant ration, was measured in a respiration calorimeter at the Pennsylvania Institute of Animal Nutrition by both direct and indirect calorimetry in eight consecutive 24-hour observation intervals to determine the effects of the rate of ventilation on the paths of outgo of heat from the animal and on total heat production. The rate of ventilation was rapid or slow in alternate 24-hour periods. The rapid rate was about 35,000 l per hour and the slow rate from 5,414 to 5,454 l per hour. During the last half of the observation periods approximately 85 percent of the moisture was removed from the ingoing air by freezing.

The outgoing air contained 10.3 times as much carbon dioxide at the slow rate of ventilation and 1.8 times as much at the high rate of ventilation as that permitted by the King standard for barn ventilation (*E.S.R.*, 20, p. 887). The moisture content of the outgoing air was 1.4 times as great at the slow rate of ventilation as at the rapid rate.

With both methods of determining heat production there was a slight decrease in the amount of heat with each change in ventilation from rapid to slow and a slight increase in the heat produced with a change from slow to rapid. About 40 percent of the heat produced was eliminated as the latent heat of water vapor, the quantity generally decreasing to some extent with a decrease in rate of ventilation.

The authors conclude that since the carbon dioxide content of the outgoing air at the slow rate of ventilation averaged 1.7 percent it was unlikely that the rate of ventilation would affect heat production if the respiration chamber was equipped with an adequate cooling system.

Analysis of the Advanced Registry records of 611 daughters of 51 Ayrshire sires, M. H. FOHRMAN and R. R. GRAVES (*U.S. Dept. Agr., Tech. Bul.* 349 (1933), pp. 59, figs. 6).—Continuing earlier work (*E.S.R.*, 55, p. 170), a study of the milk and butterfat production of 611 daughters of 51 sires and the 452 dams of these daughters is reported from an analysis of the records in the Advanced Registry of Ayrshire cattle. The daughters showed an average in-

crease of 164 lb. in milk and 0.1 percent in butterfat as compared with their dams. There was, however, much variation in the production of the daughters of individual cows and especially among the daughters of individual sires, from which it is concluded that the cows and bulls were relatively heterozygous for the production factors.

Improvements in the production of the daughters over their dams were considerably less in the case of high-producing dams. Correlations between the dams' and daughters' production were approximately +0.26 for both milk production and fat percentage. Considerably higher correlations were obtained between the dam and daughter production of single sires. The different sires showed much variation but no relation to their ranks as determined by the daughter's production. No evidence was obtained to indicate the inheritance of sex-linked factors for milk production. The importance of progeny performance tests as indicative of transmitting ability is emphasized. It is concluded that studies of Advanced Registry records give little promise of making important contributions to the knowledge of the inheritance of milk and fat production.

Methods of hand-milking: A comparison, K. BOYES and J. McCLEMONT (*Jour. Min. Agr. [Gt. Brit.]*, 39 (1932), No. 6, pp. 541-544).—A study was made to compare the following methods of milking: (1) With clean, dry hands, (2) with clean, wet hands, and (3) with clean, dry hands lubricated with vaseline.

The most striking feature of the results was the absence of *Bacillus coli* in all the samples of milk drawn with clean, dry hands. Sediment tests also showed a higher score for the milk drawn with clean, dry hands than for either of the other methods of milking.

Manganese content of milk, M. SATO and K. MURATA (*Jour. Dairy Sci.*, 15 (1932), No. 6, pp. 461-467).—A method was developed at the Hokkaido Imperial University, Japan, for determining the manganese content of biological material by the colorimetric method, which avoided the interference of the precipitation of chlorides and phosphates.

The colostrum milk of cows contained considerably more manganese than did normal milk, the first sample after parturition being especially high in this element. The milk of ewes was higher in manganese than that of cows or mares. Ewe's milk tended to increase in manganese content toward the end of lactation. Normal mare's milk contained slightly more manganese than did normal cow's milk.

Zinc content of milk, M. SATO and K. MURATA (*Jour. Dairy Sci.*, 15 (1932), No. 6, pp. 451-459).—A modification of the Birckner method (*E.S.R.*, 41, p. 464) for the determination of zinc was developed at the Hokkaido Imperial University, Japan, in which the interfering iron and manganese were removed. Determinations were made of the zinc content of human, cow's, and sheep's milk at various intervals throughout the lactation period.

The analyses showed little difference in the zinc content of the different milks. During the first few days of lactation there was a marked decrease in the zinc content of the milk. The midlactation period was marked by a rather constant zinc content, but the amount increased toward the end of lactation.

Milk deficient in solids-not-fat: An investigation on a herd of cows in Hampshire, C. E. LESSER (*Jour. Min. Agr. [Gt. Brit.]*, 39 (1932), No. 4, pp. 340-345, figs. 2).—A study was undertaken at the University of Reading, England, to determine whether by the addition or substitution of certain feeds the solids-not-fat content of milk could be improved.

Substituting kale in the ration of a group of cows instead of the mangolds fed to the rest of the herd brought about no appreciable improvement in the solids-not-fat content of the milk. The same was true of the addition of cod-liver oil and malt. The low solids-not-fat content was associated with an abnormally small quantity of lactose accompanied by a high chloride content. When the cows were turned on grass the lactose content increased and the solids-not-fat content returned to normal.

Observations on *Bacillus coagulans*, W. B. SARLES and B. W. HAMMER (*Jour. Bact.*, 23 (1932), No. 4, pp. 301-314).—An outbreak of spoiled evaporated milk which occurred during the abnormally hot dry weather of 1930 was investigated at the Iowa Experiment Station. *B. coagulans*, similar to the strain which yielded the original culture (E.S.R., 34, p. 78), was isolated from the spoiled milk, and the description of the organism was checked and enlarged.

Rather large numbers of organisms were found in the coagulated evaporated milk that had been stored for varying periods at different temperatures. The great viability of the organism made its isolation rather easy. The coagulated milk was much higher in total and volatile acidity than was normal evaporated milk. The nonvolatile acid of such milk was *d* lactic acid, while the volatile acid appeared to be made up of acetic and propionic acids. While the spoiled milk did not show any evidence of proteolysis, the organism greatly increased both the soluble and amino nitrogen in skim milk and in evaporated milk. There was no flavor or odor to the coagulated milk to suggest putrefaction. No free oxygen was found in the gas from cans of normal or coagulated evaporated milk, but the carbon dioxide content from the cans of coagulated milk was much higher than for the normal milk. Temperature was found to have a marked influence on the rate of coagulation of evaporated milk inoculated with *B. coagulans*.

The effect of the Electropure process of treating milk upon bacterial endospores, A. J. GELPI, JR., and E. D. DEVEREUX (*Science*, 76 (1932), No. 1974, pp. 391, 392).—Continuing the study of the Electropure process (E.S.R., 65, p. 262) at the Michigan Experiment Station, the investigations seemed to indicate that the destruction of endospores by this process was not entirely due to the heat created in the medium surrounding the endospores. Another heat factor involved in this destruction was the heat generated within the endospores. It was calculated that the temperature within the endospores was greater than that of the surrounding medium.

Bacteriological studies of a high-temperature, short-time pasteurizer, M. W. YALE (*New York State Sta. Tech. Bul.* 207 (1933), pp. 30, fig. 1).—Studies in cooperation with the New York State Department of Health were made of the bacteria found in milk before and after pasteurization by a short-time pasteurizer at 160° F. for 15 seconds and after pasteurization by the holder process at 143° for 30 minutes. In addition the samples of the same milk were pasteurized under like conditions in the laboratory. The bacteriological counts determined on standard nutrient agar plates showed that the pasteurization by the holder process was slightly more effective, the average count immediately following pasteurization being 17,200 per cubic centimeter for the former as compared to 20,600 per cubic centimeter for the latter. It was also of interest that the laboratory pasteurization methods gave approximately 50 percent lower bacterial counts than when the milk was pasteurized under commercial conditions.

Holding the milk for 24 hours at 40° to 45° reduced the count of bottled pasteurized milk from 22,800 at the time of pasteurizing to 9,600 per cubic centimeter at the end of the storage period. With the continued operation of

the high-temperature pasteurizer the counts were increased from 22,000 for the first 25 minutes of operation to 34,000 after from 30 to 90 minutes of operation. Foam collected from the layer on the surface of the milk of the pasteurizer yielded plate counts from 2 to 11 times higher than corresponding raw milk samples.

A biochemical study of irradiated milk, A. K. ANDERSON and H. O. TRIBOLD (*Jour. Dairy Sci.*, 15 (1932), No. 6, pp. 469-474, figs. 2).—A biochemical study was made at the Pennsylvania Experiment Station of milk and of butter from milk irradiated by allowing it to flow in a thin film down the inside of a cylinder in the center of which was a carbon arc having an energy emission of the wave length region from 2,800 to 3,100 Å. This method of irradiation allowed each particle of milk to receive a uniform dosage of light. Several samples were analyzed before and after irradiation.

The composition of milk showed very little change due to irradiation. Butter from such irradiated milk had a shorter induction period for oxidation than that from nonirradiated milk, and variations in fat constants were slight. Digestion trials in vitro with pepsin and trypsin indicated a slight speeding up of digestion during the early stages of the process, which may have been due to a destruction of anti-enzymes by the ultraviolet irradiation. Normal irradiation by the above method was not apt to produce any detectable change in the composition or digestibility of the milk.

Bleaching and cardboard flavor of milk, J. C. MARQUARDT (*Milk Dealer*, 22 (1932), No. 3, pp. 39, 40).—A study was undertaken at the New York State Experiment Station to determine the effect upon its color and flavor of freezing milk on the coils during cooling and subsequently exposing it to light. Holstein, Jersey, and mixed milk, both raw and pasteurized, and milk of high and low quality were used in this study.

Under the conditions of this test it was not possible to produce bleaching of milk by freezing it to the coils of the surface tubular coolers. Partial freezing to the coils did not change the flavor. Exposure to direct sunlight produced off flavors in milk in direct proportion to the intensity of the sunlight and the period of exposure. All of the milks tested acted alike when exposed to sunlight.

Dry storage of milk proving favorable (*New Hampshire Sta. Bul.* 270 (1933), p. 14).—In a study by W. T. Ackerman the precooling of milk with brine and storing in a dry storage compared favorably with immersing hot milk in cans in refrigerated water.

Certain biological factors related to tallowiness in milk and cream, P. H. TRACY, R. J. RAMSEY, and H. A. RUEHE (*Illinois Sta. Bul.* 389 (1933), pp. 577-595).—A study is reported of the relation of various conditions to the development of tallowy flavor in milk and cream. A relatively high temperature, 68-90° F., for the first part of the storage period and bacterial development seemed to decrease the tendency for the occurrence of the tallowy flavor. Contamination with copper salts such as might result from utensils tended to favor the development of this condition.

The score of butter made from cream stored for 5 days under different conditions before churning was higher when made from cream stored for 1 or 2 days at 68° F. and for 4 or 3 days at 40° than when stored for 5 days at 40°, and the latter butter showed a very tallowy flavor. Living yeast cells retarded the development of tallowiness in milk, but dead yeast cells and the filtrate from suspensions of yeast had no effect on the development of tallowiness during a storage period at 40°.

Determinations of the oxidation reduction potential of milk and cream indicated that the activity of bacteria and yeast tended to remove oxygen in their metabolic processes, and tallowiness resulted from the oxidation of the fats. A shorter incubation period of 68° at the beginning of the storage period, although increasing the bacterial count, had a favorable effect in tending to prevent the tallowy flavor. Winter milk is consequently more liable to have a tallowy flavor than summer milk.

Homogenization retarded the development of the tallowy flavor of milk due, it is suggested, to certain physical changes which make the detection of flavor more difficult.

Quantitative variations in vitamin A content of butter fat, G. S. FRAPS and R. TREICHLER (*Indus. and Engin. Chem.*, 24 (1932), No. 9, pp. 1079-1081).—Using a method previously described (E.S.R., 65, p. 294), the Texas Experiment Station undertook a study of the vitamin A content of butterfat from cows on different rations. The work was done with butterfat prepared from butter made by melting it, allowing the water, casein, and salt to settle, and then filtering.

Cows receiving grain and pasture produced butterfat containing from 17 to 50 units of vitamin A per gram. Butterfat obtained after the pasture had been dry and scanty for a number of weeks was still high in vitamin A. After a period of from 15 to 16 months on a ration of cottonseed meal and hulls, cows produced butterfat containing about 2 units of vitamin A per gram. Adding silage to the ration of cottonseed meal and hulls increased the vitamin A content of the butterfat to from about 2 to 12 units per gram, while the further addition of pasture increased the vitamin A content to about 33 units per gram.

The cows could transpose only a small quantity of the vitamin A of the feed into the butterfat regardless of the amount present in the feed. Cottonseed meal and hulls were very low in vitamin A, and sorghum silage, which was also low in this respect, produced butter low in vitamin A when fed over long periods.

The vitamin "B" and "G" content of dry skimmed milk and dry whey, R. C. BENDER and G. C. SUPPLEE (*Jour. Dairy Sci.*, 15 (1932), No. 6, pp. 445-450, figs. 5).—Using a method previously noted (E.S.R., 67, p. 187), a test was conducted to determine the vitamin B and G content of dried skim milk desiccated by the Just roller process, and of three samples of desiccated whey. The dried skim milk was subjected to temperatures varying between 240° and 258° F. for 2.5 seconds.

The growth-promoting properties of the vitamin G content were practically the same for the Just roller process dried skim milk and spray-dried whey. A marked variation in the vitamin B content of the dried skim milk and dried wheys was found, which was probably due to differences in treatment during commercial production. The vitamin B content of all the desiccated products studied was relatively lower than the vitamin G content. The nutritive value of each product was greatly enhanced by the addition of the vitamin B of rice polish and undoubtedly by other sources of the antineuritic factor.

Observations on some alcohol-soluble proteins from milk products, L. A. ALLEN (*Biochem. Jour.*, 25 (1931), No. 4, pp. 1045-1050).—At the National Institute for Research in Dairying, Reading, England, two alcohol-soluble proteins from Cheddar cheese and one from a peptic digest of caseinogen were isolated and their properties studied. These proteins differed considerably in composition from caseinogen and had a very low phosphorus content. Evidence

is presented to show that they are decomposition products of the caseinogen or the casein.

Cheese, L. L. VAN SLYKE and W. V. PRICE (*New York: Orange Judd Pub. Co.; London: Kegan Paul, Trench Trubner & Co., 1932, rev. and enl., pp. VIII+387, figs. 73*).—This is a revised and enlarged edition of the treatise previously noted (E.S.R., 58, p. 572).

Cheesemaking (*N.S. Wales Dept. Agr., Farmers Bul. 141, 2. ed. (1932), pp. 48, figs. 33*).—This is a revised edition of the publication previously noted (E.S.R., 47, p. 785).

The influence of different factors on the tendency of cheese to early gassy fermentation [trans. title], E. HAGLUND, E. SANDBERG, and C. BARTHEL (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 417 (1932), pp. 24, fig. 1; Eng. abs., pp. 23, 24*).—This investigation showed that it was possible by adding starters to milk intended for cheese making to prevent completely the gassy fermentation in cheese caused by aerogenes bacteria. If these additions were too large a low pH value resulted, and the resultant cheese had a friable and short consistency. The simultaneous use of starters and potassium nitrate reduced the amount of starter needed and eliminated the unfavorable effects due to the use of too much starter. Pasteurizing milk intended for cheese making to 63° C. for 10 minutes was sufficient to control gassy fermentation caused by the aerogenes bacteria. Salting the cheese in the curd greatly increased the tendency to gassy fermentation in the presence of this bacteria.

The effect of prolonged holding at pasteurization temperature on the properties of an ice cream mix, W. H. MARTIN (*Jour. Dairy Sci., 15 (1932), No. 6, pp. 481-487*).—To determine the effect of prolonged holding of an ice cream mix at pasteurizing temperature on the properties of the mix, the Kansas Experiment Station conducted a series of 5 trials with 4 mixes in each trial. A standard mix was heated to 150° F., held at this temperature for 30 minutes, 1.5, 2.5, and 3.5 hours, and a 10-gal. portion passed through the homogenizer at 2,500 lb. pressure. The mixes were aged for 24 and 48 hours before freezing. Bacterial analyses were made by the plate count method at different steps in the processing, and the mixes were also tested for viscosity, acidity, and protein stability.

The results indicated that ice cream mixes could be heated to 150° and held at that temperature for 3.5 hours without impairing the whipping properties or quality of the ice cream. There was a tendency toward a slight decrease in viscosity and an increase in protein stability as the holding period was prolonged. No serious difficulty should be encountered from heat-loving bacteria providing the processing is properly done. The majority of bacteria were destroyed after a 30-minute holding period.

A microscopic study of ice cream texture, W. C. COLE (*Jour. Dairy Sci., 15 (1932), No. 6, pp. 421-433, figs. 10*).—In this article from the California Experiment Station the author describes a method for preparing and examining samples of ice cream under the microscope. This method overcomes the inadequate illumination and the improper sectioning that has been the most common source of trouble in previous attempts to make microscopical examinations of ice cream for texture.

The study substantiates the conclusion previously drawn (E.S.R., 68, p. 665) that the rate of freezing materially affects the size of crystals formed in ice cream, and that proper methods of freezing and storing may correct many defects common to ice cream texture. It was not possible to correlate smoothness of texture as determined by size of ice crystals with size or volume of air cells.

Sandiness in nut ice creams, W. H. E. REID and M. E. POWELL (*Missouri Sta. Res. Bul.* 181 (1933), pp. 19, figs. 5).—The results are reported of eight series of tests dealing with the factors causing sandiness in ice cream and the influence of various flavors on it. The study was conducted by determining the days required for sandiness to develop. The results indicated that the factors favorable to the production of sandiness in ice cream were the presence of nuts, heat shocking, and increasing the amount of milk solids-not-fat. The factors found to retard the development of sandiness were gelatinated nuts, nut-fruit ice creams, cocoa paste, sugared nuts, boiled nuts, and autoclaved nuts, although the last two products were not recommended for mixes. It appeared that the use of maple flavoring or grapenuts had no influence upon the development of sandiness. Photomicrographs are presented to show the sugar crystals in sandy and nonsandy ice creams.

VETERINARY MEDICINE

[Report of work in New Hampshire in avian pathology and infectious abortion] (*New Hampshire Sta. Bul.* 270 (1933), pp. 21-23).—Brief reference is made to the progress of work (E.S.R., 67, p. 596) on paralysis of poultry, by C. L. Martin; coccidiosis control, by Martin, C. A. Bottorff, and T. B. Charles; storage of fowl pox vaccine, by Martin and Bottorff; infectious abortion eradication, by Martin; fowl pneumonia, by Martin and Bottorff; and pullorum disease eradication, by Bottorff.

Eighteenth report of the director of veterinary services and animal industry, I, II, P. J. DU TOIT ET AL. (*Union So. Africa Dept. Agr., Rpt. Dir. Vet. Serv. and Anim. Indus.*, 18 (1932), pts. 1, pp. [VII]+523, pl. 1, figs. 155; 2, pp. 597-610, fig. 1, pp. 871-972, figs. 19, pp. 1005-1035, figs. 2, pp. 1037-1040, 1061, 1062, fig. 1).—The contributions here presented (E.S.R., 67, p. 70) include the following: Bovine Anaplasmosis: A Method of Obtaining Pure Strains of *Anaplasma marginale* and *Anaplasma centrale* by Transmission through Antelopes, by W. O. Neitz and P. J. du Toit (pp. 3-20) (E.S.R., 69, p. 107); The Trypanosome Infections of *Glossina pallidipes* in the Umfolosi Game Reserve, Zululand—Preliminary Report, by A. B. M. Whitnall (pp. 21-30); A Note on *Aegyptianella pullorum* in the Fowl in South Africa, by E. M. Robinson and J. D. W. A. Coles (pp. 31-34) (E.S.R., 69, p. 114); The Immunization of Mules with Formalized Horse-Sickness Virus, by P. J. du Toit and W. O. Neitz (pp. 35-47); On the Aetiology of Heartwater, by C. Jackson and W. O. Neitz (pp. 49-70); Rabies as It Occurs in the Union of South Africa, by W. O. Neitz and I. P. Marais (pp. 71-98); East African Virus Disease in Pigs, by D. G. Steyn (pp. 99-109); Immunisation of Fowls against Fowl Pox by Use of Pigeon Pox Virus, by A. S. Canham (pp. 111-140) (E.S.R., 69, p. 112); The Occurrence of *B[acillus] oedematiens* in South Africa, by J. R. Scheuber (pp. 141-143); Goat Mange—The Infectivity of Kraals, by P. J. du Toit and G. A. H. Bedford (pp. 145-152); Wild Antelopes as Carriers of Nematode Parasites of Domestic Ruminants, Part II (pp. 153-172) (E.S.R., 67, p. 70), and *Syngamus indicus*, a New Nematode from the Indian Elephant (pp. 173-175), both by H. O. Mönnig; On a New Species of Tetrameres (*Tetrameres paradisea* sp. nov.) from Stanley Cranes (pp. 177-182) and Some Helminths from South African Chiroptera (pp. 183-196), both by R. J. Ortlepp; Distribution of *Glossina* in the Bechuanaland Protectorate, by H. H. Curson (pp. 197-219); Description of *Argas striatus*, a New Species of Tick (pp. 221, 222) and A Synoptic Check-List and Host-List of the Ectoparasites Found on South African Mammalia, Aves, and Reptilia (Second Edition) (pp. 223-523) (E.S.R., 57, p. 77), both by G. A. H. Bedford; The Effects of Sulphur on Merino Sheep and Their Re-

sistance to Potassium Cyanide Poisoning (pp. 597-610) (E.S.R., 66, p. 110), Investigations into the Toxicity of Known and Unknown Poisonous Plants in the Union of South Africa (pp. 871-891) (E.S.R., 67, p. 70), *Chrysocoma tenuifolia* Berg. Poisoning in Angora Goats and the Development of Tolerance (pp. 893-898), A Study of the Factors Concerned in the Determination of the Toxicity of *Cotyledon orbiculata* L. (pp. 899-938), and Experiments with Potassium Cyanide on Rabbits (pp. 939-945), all by D. G. Steyn; Crotalariaosis in Sheep, by D. G. Steyn and G. de Kock (pp. 947-953); Isolation and Chemical Examination of the Poisonous Principles of *Dimorphotheca spectabilis* Schltr. and *Dimorphotheca zeyheri* Sond., by C. Rimington (pp. 955-972); Researches into Dips and Dipping—A, Lime Sulphur Dips, Paper I, General Introduction—Lime Sulphur Dips, by H. Graf and T. J. Wilken-Jorden (pp. 1005-1014); Researches into Dips and Dipping—A, Lime Sulphur Dips, Paper II, A New Laboratory Method of Chemical Analysis (pp. 1015-1027) and Paper III, A Preliminary Study of a Colorimetric Method as a Rapid Means of Control of Polysulphide Solutions (pp. 1029-1035), both by T. J. Wilken-Jorden; The Normal Temperature of Merino Sheep during January in the Karroo and How It Is Influenced by Exercise, by J. Quinlan and G. S. Maré (pp. 1037-1040); and A Peculiar Case of Traumatism Affecting the Metatarsal Bones, by N. T. v. d. Linde (pp. 1061, 1062).

[Studies in comparative pathology, etc., in Japan] (*Jour. Japan. Soc. Vet. Sci.*, 11 (1932), No. 4, pp. 275-396, pls. 5, figs. 5).—Contributions presented (E.S.R., 68, p. 812) are as follows: Contribution to the Knowledge of the Anatomical Position of the Parathyroid Glands of the Horse, by S. Hashimoto and T. Kato (pp. 275-284, Ger. abs. p. 284); The Virulence of the Virus of the So-called "Korean Fowl Plague", by J. Nakamura, S. Oyama, and N. Tomonaga (pp. 285-301, Ger. abs. pp. 298-301); The Pathological Anatomy of "Korean Fowl Plague" Caused by a Filtrable Virus, by T. Fukushima, K. Shimomura, and S. Oyama (pp. 302-316, Japan. abs. p. 316); On the Chemical Composition of Bovine Saliva Referred to the Results of Blood Analysis, by M. Umezu (pp. 317-338, Eng. abs. pp. 336-338); Studies on Contagious Pleuropneumonia in Cattle—XI, On the So-called "Nonspecific Reaction" in the Complement-Fixation Test of Lung Plague, by S. Yamagiwa, S. Ito, and T. Inoue (pp. 339-362, Eng. abs. pp. 360-362); Studies on the Drug Refractoriness of the Rat-Bite Fever Spirochete, *Spirochaeta morsus muris*—II, Arsenic Refractoriness, by S. Akazawa (pp. 363-382, Ger. abs. pp. 380-382) (E.S.R., 62, p. 167); and Bacteria of the Paratyphoid Group Isolated from the Pig, with Particular Regard to Antigen Analysis, by T. Konno and T. Tanikawa (pp. 383-396, Japan. abs. p. 396).

Arrow grass—chemical and physiological considerations, O. A. BEATH, J. H. DRAIZE, and H. F. EPPSON (*Wyoming Sta. Bul.* 193 (1933), pp. 36 figs. 9).—Chemical and physiological tests of arrowgrass, of which *Triglochin maritima*, a plant widely distributed over Wyoming, is the dominant species, have proved conclusively that hydrocyanic acid, which occurs mainly in the leaves, is the active poisonous principle. "Poisoning of livestock, sheep, and cattle principally may occur at any time during the period of the active growth of the plant. The drying of arrowgrass results in the loss of varying amounts of hydrocyanic acid. However, the toxicity does not decrease in proportion to this loss, because when the dried material is fed the acid remaining is more readily and completely released than the acid in the original green plants. Water is the most satisfactory solvent for the extraction of the toxic principle. Ammonium sulfate (solid) precipitates a toxic complex from aqueous extracts of the plant, which, upon administration, gives physiological symptoms of arrowgrass poisoning.

"The regrowth developing from cut-over meadows is particularly important because of (1) its saline succulent character, (2) its freedom from stems and its comparatively high hydrocyanic acid content, and (3) its increasing chance of being eaten by livestock owing to the practice of grazing cut-over meadows in the late summer and fall. The occurrence of the mixed chlorides, particularly sodium chloride, is of importance, where livestock may seek out the plant to satisfy their salt requirements. The symptoms of acute arrowgrass poisoning appear to be those observed in hydrocyanic acid poisoning. Respiratory failure is the cause of death. The autopsies reveal marked asphyxia. The toxicity of the whole plant in its various stages of growth has been determined with sheep. The toxicity of various plant parts has been determined with the rabbit. Frosted, wilted, and stunted plants are less toxic than the normal bush growth. Various air-dried samples of plant or plants cured in hay do not lose their toxicity uniformly. Some samples, for unknown reasons, retain enough toxicity to make them dangerous if fed in the hay in which it naturally is found."

Three species of *Zygadenus* (death camas), O. A. BEATH, H. F. EPPSON, J. H. DRAIZE, and R. S. JUSTICE (*Wyoming Sta. Bul.* 194 (1933), pp. 39, figs. 18).—The authors show that the occurrence of death camas in Wyoming is confined to the three species *Z. gramineus*, *Z. paniculatus*, and *Z. elegans*, of which the first and last mentioned have the widest distribution.

"Chemical assays have been made to show the distribution of the alkaloids in the several plant parts at representative stages of growth. All three were found to give similar seasonal alkaloidal trends. The potency of *Z. gramineus* did not vary materially at two horizons of growth, viz, at 7,200 and 8,500 ft. elevation. *Z. elegans* was found to have a varied alkaloidal content in plants of corresponding stages of growth, but from different environments. Those taken from the Laramie Plains gave, on a 3-year average, a higher alkaloidal content than the camas plants of the higher ranges. New plants were found to originate mainly from terminal root buds. Seeds rarely gave rise to seedlings under range conditions."

It was found that if camas plants are clipped back in their early stages of growth, a response to renewed growth is rapid and in a few days normal size is obtained. On the whole, repeated clipping over a 3-year period shows (1) for the second year retarded development, (2) for the third year dwarfed and sickly plants, but alkaloidal content high initially, and (3) for the fourth year plants so small as to be barely recognizable.

"The young *Z. gramineus* and *Z. paniculatus* plants are equally toxic. *Z. elegans* at a comparable stage of growth is approximately one fourth as toxic as the other two. The very young plants and the seeds are the most toxic parts for the three species. *Z. elegans* is not a severe convulsant plant poison. The less severe distress in animals poisoned with *Z. elegans* and the lesser toxicity of this plant may indicate either that the alkaloids of this plant are less toxic or that there is the presence of a substance of an antidotal character. The crude alkaloids administered in acidic solutions (pH 2 to 4) exhibit greater toxicity than in neutral or slightly alkaline solutions (pH 7 to 8). This may be due to the greater solubility of the alkaloids in acidic solutions and hence quicker and more complete physiological absorption.

"Lambs suffer prenatal injury from severely poisoned mothers. Suckling lambs suffer no injury from the milk of poisoned mothers."

Factors which may modify precipitin tests in their applications to zoology and medicine, H. R. WOLFE (*Physiol. Zool.*, 6 (1933), No. 1, pp. 55-90).—This discussion is presented in connection with a list of 35 references to the literature.

Rotenone—a new parasiticide, D. B. CRANE (*Cornell Vet.*, 23 (1933), No. 1, pp. 15-31).—The author has found that "rotenone is nontoxic to dogs when given in amounts up to $\frac{1}{3}$ g of rotenone per kilogram of body weight. Gastritis and enteritis are caused by doses of $\frac{1}{5}$ or $\frac{1}{10}$ g of rotenone per kilogram of body weight, but this is very transitory and apparently leaves no after-effects. No symptoms of motor paralysis were observed in dogs of any age when given $\frac{1}{20}$, $\frac{1}{15}$, $\frac{1}{10}$, and $\frac{1}{5}$ g of rotenone per kilogram of body weight. Young dogs are less apt to be depressed or nauseated by very large doses than old animals. Rotenone is less apt to cause nausea when given on an empty stomach than on a full stomach. As in the case of other vermicides, rotenone is more effective when given after a period of starvation. Eighteen to 24 hours is the optimum starvation period; a longer period has no advantage.

"When given in a dosage of $\frac{1}{20}$ g per kilogram of body weight, rotenone is effective against the dog hookworm, *Ankylostoma canina*, and the roundworms *Toxascaris limbata* and *Belascaris marginata*. Rotenone in a dosage of $\frac{1}{20}$ g per kilogram of body weight is probably of only moderate efficiency against the coccidium of dogs, but observation of a larger number of infested animals over a larger period of time is necessary before any accurate conclusions can be made. Rotenone is apparently of little or no use against the canine tapeworms. In 11 of the 13 cases in which it was used, rotenone caused an unusually rapid recovery from follicular mange. The remaining 2 cases recovered in the time usually necessary for the standard remedies."

The germicidal efficiency of sodium hydroxide, E. C. McCULLOCH (*Jour. Bact.*, 25 (1933), No. 5, pp. 469-493, figs. 6).—This contribution from the Wisconsin Experiment Station reports at length upon investigations of the germicidal efficiency of sodium hydroxide, of which high-test commercial lye was shown as a satisfactory source, when employed against nonsporulating micro-organisms. Preliminary reports on this work have been noted (*E.S.R.*, 68, p. 815; 69, p. 107).

It is concluded that "high-test commercial lye appears to satisfy the need for a disinfectant which is suitable for use in barns and stables and which is inexpensive, odorless, and very efficient against *Brucella abortus* and related micro-organisms. The velocity of disinfection with sodium hydroxide between 25° and 2° C. is independent of temperature changes. This phenomenon appears to be correlated with the peculiar physicochemical reaction of sodium hydroxide solutions to temperature changes, wherein the ratio of the hydroxyl-ion activity to the hydrogen-ion activity increases with a decrease in temperature. The increase of the hydroxyl-ion activity over the hydrogen-ion activity at the lower temperature approximately balances the greater germicidal efficiency of each hydroxyl-ion at the higher temperature. At a given temperature, a given hydroxyl-ion concentration possesses a germicidal activity which is independent of the amount of alkali used to attain the hydroxyl-ion concentration. It is therefore concluded that the activity of the hydroxyl-ions is the most important factor in the destruction of micro-organisms by sodium hydroxide."

A list of 29 references to the literature is included.

The absence of serological relationship between *Brucella* and *Pasteurella* organisms, F. W. PRIESTLEY (*Jour. Compar. Path. and Ther.*, 46 (1933), No. 1, pp. 38-41).—The author finds that under the conditions described *Brucella* organisms are not agglutinated by *Pasteurella* sera and that *Pasteurella* organisms are not agglutinated by *Brucella* sera, there being no serological relationship between members of the two genera.

The practical value of the heat-stable antigen of *C. chauvoei* as an immunising agent, R. S. ROBERTS (*Jour. Compar. Path. and Ther.*, 46 (1933), No. 1, pp. 56-61).—The author has found that "guinea pigs can be afforded a

moderate degree of immunity against artificial infection with *C[lostridium] chauvoei* by inoculation with large quantities of the pure 'O' antigen [somatic component] of the organism. The claim that this antigen confers almost complete immunity against 100 and 1,000 lethal doses of *C. chauvoei* organisms has not been confirmed, and doubt is cast upon the value of the artificially activated spore suspension as an agent for the estimation of immunity. Immunization of farm animals by O antigen alone is unlikely to be of practical value."

The desiccation and preservation of infectious laryngotracheitis virus, C. S. GIBBS (*Jour. Bact.*, 25 (1933), No. 3, pp. 245-251, fig. 1).—In this contribution from the Massachusetts Experiment Station a laboratory method for the desiccation and preservation of infectious laryngotracheitis virus is described.

The similarity of virus pneumonia in animals to epidemic influenza and interstitial bronchopneumonia in man, H. A. MCCORDOCK and R. S. MUCKENFUSS (*Amer. Jour. Path.*, 9 (1933), No. 2, pp. 221-252, pls. 4).—This discussion is presented in connection with a list of 63 references to the literature.

Rinderpest, G. CURASSON (*La Peste Bovine. Paris: Vigot Bros., 1932, pp. 334*).—This extended account of rinderpest in 10 chapters is presented in connection with a bibliography of 38 pages. A preface by H. Vallée is included.

Biological and immunological studies of the human and the equine strains of hemolytic streptococci, I, II, S. UMENO (*Kitasato Arch. Expt. Med. [Tokyo]*, 10 (1933), No. 1, pp. 1-40, pl. 1, figs. 6).—The first part of this contribution (pp. 1-17) reports upon a comparative study of the biology of such streptococci and part 2 (pp. 18-40) upon immunology.

The biochemical characters of human and animal strains of hemolytic streptococci, P. R. EDWARDS (*Jour. Bact.*, 23 (1932), No. 3, pp. 259-266).—In investigations at the Kentucky Experiment Station aimed at discovery of a biochemical method of differentiating streptococci of human and animal origin, a brief reference to which has been noted (*E.S.R.*, 68, p. 527), the author worked with a group of 90 strains of streptococci isolated from horses, cattle, swine, and chickens, together with 36 strains of human origin used for comparison. It was demonstrated that the animal cultures produce a higher acidity in glucose broth than do the human cultures. It was also demonstrated that 94 percent of the animal strains can be clearly differentiated from the human cultures by the fact that they produce acid from sorbitol and fail to ferment trehalose. The streptococci of human origin all ferment trehalose and fail to attack sorbitol.

Further studies on the differentiation of human and animal strains of hemolytic streptococci, P. R. EDWARDS (*Jour. Bact.*, 25 (1933), No. 5, pp. 527-536).—This is a report of work conducted at the Kentucky Experiment Station in continuation of that above noted.

In the study of 248 strains of hemolytic streptococci of human and animal origin, including 75 of human and 173 of animal origin here reported upon, the author "demonstrated that a large majority of the strains that were of animal origin, namely, 96 percent, could be distinguished from the human cultures by their action on sorbitol and trehalose. The animal strains fermented sorbitol but did not produce acid from trehalose. The human strains, on the contrary, fermented trehalose but did not attack sorbitol. The small group of animal strains which resembled the human cultures in fermentative reactions all reduced methylene blue under suitable conditions. Under the same conditions only 4 percent of the human strains reduced the dye. *Str[eptococcus] equi* was differentiated from all other human and animal strains by its inability to ferment lactose, sorbitol, or trehalose. The sorbitol-fermenting animal strains (type A) and *S. equi* regularly produced capsules. The sorbitol-

fermenting strains possessed the characters usually attributed to *S. epidemicus*. The sorbitol-fermenting strains of animal origin rarely, if ever, infect man. However, human streptococci are occasionally found in mastitis of cows."

Trichostrongylus in New York State, D. W. BAKER (*Cornell Vet.*, 23 (1933), No. 1, pp. 71-73, fig. 1).—The author reports upon cases investigated during the preceding year which indicate a rather general distribution of *T. axei* in New York State. It is pointed out that while most species of parasitic roundworms have but one or a very limited number of host species, *T. axei* has been reported from 14, including man.

Experimental infection with *Trypanosoma cruzi* from intestine of cone-nose bug, *Triatoma protracta*, C. A. KOFOID and F. DONAT (*Soc. Expt. Biol. and Med. Proc.*, 30 (1933), No. 4, pp. 489-491).—The authors conclude that *Trypanosoma triatomae* K. & McC. of the cone-nose bug (*Triatoma protracta*) in California is identical with that found in *T. megista* and in other reduviids of South and Central America known to be vectors of Brazilian human trypanosomiasis. "The determination of this identity extends the geographical range of the infected insect vector into the southwestern United States. Mammals naturally infected have not as yet been discovered in this region, but further investigation by splenectomizing suspected mammals in regions where infected bugs are found may be expected to reveal the infection."

Types of tubercle bacilli in human tuberculosis, R. M. PRICE (*Canad. Jour. Res.*, 7 (1932), No. 6, pp. 606-616).—In the work here reported a total of 14.1 percent of the 268 cases of tuberculosis in children under 14 years of age was found to be due to the bovine type, as was 3.5 percent of the 168 adult cases studied.

The toxicity of iodine for the cells of *Mycobacterium tuberculosis*, G. KNAYSI (*Jour. Infect. Diseases*, 50 (1932), No. 3, pp. 255-260).—The experiments reported show that iodine is toxic to the tubercle bacillus cells. These cells were unable to grow on slants after 30 minutes contact with as high a dilution of iodine as 1:10,000, or to infect guinea pigs after an exposure of 15 minutes to iodine in the dilution 1:5,000.

The use of iodine and of certain iodine compounds in experimental tuberculosis, G. KNAYSI (*Jour. Infect. Diseases*, 50 (1932), No. 3, pp. 261-268).—The experiments with rabbits here reported show that iodine, when administered under the conditions described, is not effective in the treatment of tuberculosis, in spite of its relatively low toxicity for the animal body and its strong germicidal action against the tubercle bacillus.

New medium and treatment for isolation of tubercle bacilli, A. M. WAHBY (*Zentbl. Bakt. [etc.]*, 1. Abt., Orig., 123 (1932), No. 7-8, pp. 504-510).—The author describes a new medium which has been developed for isolation of the tubercle bacillus and outlines a special treatment of tuberculous contaminated material. Suppression of growth of saprophytic acid-fast bacilli and prevention of spores from germination have been accomplished. Proof of the need of glycerin by the bovine type has been shown. The neutralization of the new medium with KOH has been found more desirable than NaOH.

A list of 41 references to the literature is included.

[Worms in hogs, poultry, and sheep] (*Montana Sta. Circs.* 140 (1933), pp. 8, figs. 4; 141 (1933), pp. 6, fig. 1; 142 (1933), pp. 8, figs. 5).—Practical information is here brought together by the station cooperating with the Montana Livestock Sanitary Board, dealing respectively with Worms in Hogs, Intestinal Worms in Poultry, and Intestinal Worms in Sheep.

The parasitic helminths of Canadian animals.—I, The Cestodaria and Cestoda, R. A. WARDLE (*Canad. Jour. Res.*, 8 (1933), No. 4, pp. 317-333).—The

author records 1 adult cestodarian, 53 adult Cestoda, and 24 larval Cestoda known to occur in Canadian animals. The account is presented in connection with a list of 67 references to the literature.

Protection of the rat against infection with a larval tapeworm by serum from immune rats, H. M. MILLER, JR., and M. L. GARDINER (*Soc. Expt. Biol. and Med. Proc.*, 29 (1932), No. 6, pp. 779, 780).—The results obtained in two experiments show that complete protection of the rat against the larval stage of *Cysticercus fasciolaris* and onchospheres of the tapeworm *Taenia taeniaeformis* may be obtained by the injection of serum from infected rats.

Influence of age on amount of normal agglutinins in the blood of cattle, E. O. JORDAN (*Soc. Expt. Biol. and Med. Proc.*, 30 (1933), No. 4, pp. 446, 447).—The author has found that the older bovines contain in their serum specific bacterial agglutinins which are absent or very scanty in the young, and which are not likely to have been generated by infection with the specific homologous bacteria.

The most important infectious and other diseases of the milk cow and milk inspection laws, C. EHRLICH (*Die Wichtigsten Seuchen und Krankheiten der Milchkühe und das Reichsmilchgesetz. Hildesheim: Molk. Ztg.*, 1931, pp. XI+212, figs. 106).—A handbook on the diseases of the dairy cow of major importance and sanitary regulatory measures.

Anaplasmosis, I, II, G. DIKMANS (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 5, pp. 739, 740, 741-748).—Observations of the occurrence of this infection in cattle in Louisiana are recorded in the first part (pp. 739, 740), followed in the second part (pp. 741-748) by a short review of its occurrence in connection with a list of 20 references to the literature and a preliminary demonstration of its identity in Louisiana.

The portals of entry of bovine infectious abortion [trans. title], K. BÜCHLI (*Tijdschr. Diergeneesk.*, 60 (1933), No. 7 pp. 337-344; *Ger., Eng., Fr. abs.*, p. 344).—The author reports having infected five young heifers with *Brucella abortus* in as many ways, namely, by mouth, by vagina, through the skin, through the teat, and through the eye.

The rapid spread of Bang's disease in an accredited herd, F. THORP, JR., and R. GRAHAM (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 5, pp. 749-752, fig. 1).—The authors report upon an accredited herd in which in a period of two years approximately three fifths of the nonreacting animals of breeding age became positive to the agglutination test for *Brucella abortus*. The total number of reactors developing during this period was equivalent to approximately 80 percent of the original herd. The nonreacting unit, after 2 years, is approximately one half the size of the herd when the disease first appeared.

Infectious abortion of cattle in the Netherlands [trans. title], K. BÜCHLI (*Tijdschr. Diergeneesk.*, 60 (1933), No. 3, pp. 125-130; *Ger., Eng., Fr. abs.*, pp. 129, 130).—It is said that infectious abortion due to *Brucella abortus* occurs in all 11 Provinces of the Netherlands and on more than 40 percent of the farms, although on many the number of cows which abort is very small.

Agglutinability of homologous and heterologous strains of *Brucella* organisms during the course of *Bacillus abortus* Bang infection, R. N. NAIK (*Indian Jour. Vet. Sci. and Anim. Husb.*, 2 (1932), No. 3, pp. 262-264).—The author has found the serum of a bull infected with *B. abortus* (English strain) to give (1) against the homologous strain a positive agglutination reaction for about 5 months, a suspicious one for the next 5 months, and a negative one at about the end of a year; (2) against *B. abortus* 4 (Indian strain) more or less the same reaction as against the homologous strain, but the reaction was less marked after about 5 months; (3) against *B. abortus* 3 (Indian

strain) a positive reaction for a period of about a month and a negative one for the rest of the period; and (4) against *B. melitensis* (English strain) a positive reaction for about 5 months and then a negative one for the rest of the period.

The inter-relation of strains of *Brucella*, T. SMITH (*Vet. Med.*, 28 (1933), No. 3, pp. 98, 99).—The author reports that in a recent study of 39 cases of abortion in cattle 17 were found associated with *B. abortus*, 5 with vibrios, 2 with *B. abortus* and vibrios, and 15 with these bacteria absent, the cause not having been determined. The importance of a thorough knowledge of the races of *Brucella* is emphasized.

Br. abortus in town milk supplies, C. S. M. HOPKIRK and D. A. GILL (*Vet. Rec.*, 13 (1933), No. 13, p. 261).—During the last two years examinations have been made in New Zealand of composite milk samples from herds supplying cities and towns. Of 642 guinea pigs injected, 36 percent reacted positively to the agglutination test for *Brucella abortus* (bovine type) and 64 percent negatively. Upon post-mortem examination lesions were found occurring in 67.1 percent of the 231 reactors. No lesions were found in 398 of the 411 non-reacting guinea pigs, and the remaining 13 had enlarged spleens that may or may not have been due to *B. abortus* infection.

Efficacy and safety of abortion vaccines prepared from *Brucella abortus* strains of different degrees of virulence, W. E. COTTON, J. M. BUCK, and H. E. SMITH (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 4, pp. 291–314).—Experiments are reported, in which 36 cows and heifers, all negative to the agglutination test for abortion, were used to determine the comparative immunizing value and the comparative freedom from objectionable features of different strains of *B. abortus*, the details being presented in large part in tabular form. Three strains representing three different degrees of virulence, as indicated by guinea pig inoculations, were employed. The data obtained are considered to justify the following conclusions:

“In the preparation of abortion vaccine for use in nonpregnant cattle, the virulence of the *B. abortus* strain or strains from which the vaccine is prepared is a matter of great importance, particularly when the vaccine is to be used as an immunizing agent for nonpregnant cows with functioning udders. The virulence of *B. abortus* strains for cattle can be determined with a considerable degree of accuracy by their effects on guinea pigs. Abortion vaccine prepared from strains of *B. abortus* sufficiently virulent to cause extensive lesions in guinea pigs is likely to implant the infection in the udders of nonpregnant cows and may be eliminated in the milk for long periods. Abortion vaccine prepared from strains of *B. abortus* of greatly reduced virulence, as indicated by guinea pig inoculation results, gives evidence of being reasonably efficient as an immunizing agent for abortion disease free cows and heifers when the vaccine is administered subcutaneously two months or more before service. The danger of such a vaccine being implanted in the udder of the vaccinated animal seems to be slight.

“There appears to be more danger of causing infection of the udder, in which it may persist for a long time, if the vaccine is injected intradermally than if it is injected subcutaneously; hence, the former seems to be a less satisfactory method of administration. The conjunctival method of exposure regularly transmits abortion disease to cattle.”

Efficacy of an avirulent strain of *Brucella abortus* for vaccinating pregnant cattle, W. E. COTTON, J. M. BUCK, and H. E. SMITH (*Jour. Agr. Res. [U.S.]* 46 (1933), No. 4, pp. 315–326).—In experiments conducted with a view to determining the efficacy of an avirulent strain of *B. abortus* for vaccinating preg-

nant cattle against abortion disease, vaccines were prepared and administered subcutaneously to three pregnant cows and seven pregnant heifers. The strain of *B. abortus* used for the vaccines was isolated in 1915 from the milk of an infected cow and had undergone from 182 to 193 transfers on artificial culture media when the vaccines were prepared.

Inoculation tests showed one strain to be nonpathogenic for cattle and guinea pigs. The agglutinating value of the strain, however, was not impaired. From 1 to 2 months after vaccination 10 experiment animals were exposed to virulent strains of *B. abortus*; 9 other animals were used as controls. The vaccines gave evidence of conferring immunity against abortion disease to 40 percent of the vaccinated animals; only 11 percent of the control animals resisted the disease. No evidence was obtained to indicate that the strain becomes localized in the udders of vaccinated animals.

Vaccination against contagious bovine abortion, J. McFADYEAN (*Jour. Compar. Path. and Ther.*, 46 (1933), No. 1, pp. 50-55).—The author considers the inoculation of pregnant cows and heifers with living abortion bacilli to be indefensible.

Relationships of leucocytes and streptococci to fibrosis of the udder, G. J. HUCKER (*Amer. Jour. Pub. Health*, 23 (1933), No. 3, pp. 237-245, figs. 6).—In this contribution from the New York State Experiment Station the author finds that "milk containing more than 500,000 cells per cubic centimeter always indicates an abnormal or pathological condition in the udder. Milk containing large numbers of cells will generally continue to contain excessive numbers, while milk with a small number of cells rarely shows more than 200,000 per cubic centimeter. Variation in number of cells per cubic centimeter is greater in milk containing large numbers of cells than milk showing a smaller number. Alkaline reaction to bromothymol blue is never obtained on freshly drawn milk from a fibrosis-free quarter. When streptococci are found in aseptically drawn milk, the quarter is always indurated. All quarters free from scar or indurated tissues never show demonstrable streptococci or cells in excess of 150,000 per cubic centimeter in the milk. Not all indurated quarters show streptococci or a significant number of cells. Milk from a normal quarter or free of fibrosis does not contain long-chained streptococci or cells in excess of 150,000 per cubic centimeter."

Relation between the presence of fibrotic tissue in the udder and streptococci or cells in freshly drawn milk, G. J. HUCKER and D. H. UDALL (*Cornell Vet.*, 23 (1933), No. 1, pp. 32-39).—Contributing from the New York State Experiment Station and the department of medicine, New York State Veterinary College, the authors report having found that "udders free from indurations or scar tissue are free from demonstrable streptococci. Udders free from indurations or scar tissue are also free from cells in excess of 500,000 per cubic centimeter. In addition, these udders do not give a positive reaction to bromothymol blue. Cell counts greater than 500,000 per cubic centimeter indicate that the milk has been secured from an udder containing an appreciable amount of fibrosis. When streptococci are found in milk aseptically drawn from the udder, the quarter is always indurated. Not all indurated quarters, even when studied over a period of months, show streptococci or a significant number of cells."

Six years' experience with a herd experimentally infected with Johne's disease, W. A. HAGAN and A. ZEISSIG (*Cornell Vet.*, 23 (1933), No. 1, pp. 1-15, figs. 6).—In experimental work Johne's disease was regularly transmitted to cattle by drenching them with rather large amounts of infective materials, but in a few attempts the authors failed to infect cattle by administration of infective material intravenously. "Under conditions of severe exposure a

considerable number of animals failed to contract the disease naturally. The first naturally acquired infection did not appear in our experimental herd until 3 years after the herd had been established and over 2 years after the first scouring animal had lived in the herd. When large amounts of infective materials were given by drenching, the incubation period of the disease varied from 5 months to more than 2 years. Only 3 animals out of 9 infected in this way, showed incubation periods of less than 1 year."

While the incubation period in animals naturally infected cannot be accurately fixed, in the case of calves born in the herd in the midst of the infection (counting the period from the day of birth) the incubation period of none has been less than 2 years and in some has been over 3 years. "The state of pregnancy appears to have had a retarding influence on the course of the disease in a number of instances. Infected pregnant animals have not shown symptoms, in most cases, until after parturition. Animals infected very early in life frequently have proven sterile.

"Allergic tests, employing avian tuberculin administered intravenously, have given reasonably consistent results in our experimental herd. We believe the test is sufficiently accurate to be employed in practical control work. The complement-fixation test has been of value in our own herd and has agreed, in most instances, with the results of the allergic tests. This test is not specific for Johne's disease, however, and has proven inaccurate in many herds. The inaccuracies consist not so much in missing infected animals as in giving positive reactions with the blood of noninfected animals. The cause of these reactions is not known. Animals in advanced stages of Johne's disease frequently do not react to avian tuberculin. These animals always fix complement."

Experimental bovine mastitis, F. B. HADLEY and W. D. FROST (*Cornell Vet.*, 23 (1933), No. 1, pp. 40-46).—The authors report upon experimental inoculation of the streptococci-free udders of normal cows with various types and strains of streptococci; recovered from bovine, equine, and human sources, by an original method developed at the Wisconsin Experiment Station.

They have found that "*Str[eptococcus] epidemicus*, a beta hemolytic type, is a micro-organism that has been demonstrated to infect man, cattle, horses, and foxes. Strains from human, bovine, and equine sources proved to be the most highly pathogenic for cows of all the streptococci studied in that they were capable of causing a severe mastitis which usually resulted in destroying the function of the infected quarters.

"*S. mastitidis*, also a beta hemolytic type, is an organism occasionally found infecting cows' udders. It was shown to be capable of causing a severe and more or less chronic mastitis in the test cows. *S. infrequens* is another beta hemolytic type. The strain used was recovered from the throat of a milker (human strain); it proved to be incapable of causing mastitis although it was recovered from the milk the day following inoculation.

"*S. equi* is yet another beta type. It causes strangles in horses. It is seldom found in spontaneous cases of mastitis. We have isolated it only four times in the routine examination of many thousand samples of freshly drawn milks. In one of the three quarters exposed it secured a permanent foothold; in another it was demonstrable for about four weeks. In neither did it induce mastitis, thus indicating its low virulence for the cow's udder.

"*S. mitis*, an alpha hemolytic type, is the organism most frequently isolated by us from chronic cases of mastitis. Some of the strains were found to be capable of setting up a severe and permanent mastitis in test cows, while other strains caused only a temporary disturbance. Either the test cows had different degrees of resistance, or the organisms varied in their disease-producing

ability. Probably both factors contributed to the results, so it seems permissible to state that either different strains of *S. mitis* vary in virulence or different cows vary in susceptibility.

"A coli form bacillus was experimented with because it was found as the predominating organism in several cases of severe bovine mastitis. The strain used induced the chronic form of the disease." (See also E.S.R., 69, p. 274.)

Study of a filter-passing strain of a *Streptococcus* isolated from a case of bovine mastitis, F. H. PRISSICK (*Canad. Jour. Res.*, 8 (1933), No. 3, pp. 217-233, pls. 3, fig. 1).—The author reports that a *Streptococcus* of the viridans group obtained from a case of bovine mastitis and similar to that usually associated with chronic mastitis in cattle has under stated conditions been passed through Berkefeld N and Chamberland L 3, L 5 filters. It has been recovered from the filtrates and proved to be identical in its biological characteristics with the original unfiltered strain. Filtrates of this organism grown in K medium have given the largest number of recoveries, these being 18 out of 20, or 90 percent. Filtrates of growth in nutrient broth were recovered in 1 out of 20 filtrations, or 5 percent.

The trichomonad disease of cattle and the vaginal catarrh problem [trans. title], ABELEIN (*München. Tierärztl. Wchnschr.*, 83 (1932), Nos. 22, pp. 253-257; 24, pp. 279-285; 25, pp. 292-296; 26, pp. 305-309; 27, pp. 318-322, figs. 3; abridged trans. in *Cornell Vet.*, 23 (1933), No. 1, pp. 47-58).—It is concluded that the granular or nodular venereal disease and the vesicular venereal disease cause relatively limited losses, and that the trichomonad disease is a wholly unrelated, specific malady of major importance. The review is by W. L. Williams.

Experimental erysipeloethritic arthritis in lambs, H. MARSH (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 5, pp. 753-766, figs. 6).—In this contribution from the Montana Experiment Station the author reports having found that "a chronic arthritis, corresponding in every way to the naturally occurring disease, can be produced in lambs by inoculating *Erysipelothrix rhusiopathiae* intravenously or into the umbilical cord. The typical disease can be produced by exposing the stump of the umbilical cord, the docking wound, or the castration wound to soil which has been impregnated with cultures of *E. rhusiopathiae*. Agglutinins for *E. rhusiopathiae* are produced in the blood of both naturally and artificially infected animals.

"A comparison of three methods of docking indicates that infection is much less likely to occur following docking with the hot iron than with the knife or the emasculator. The experimental results are confirmed by field experience with docking methods. The experimental results correlated with field experience justify the conclusion that the principal portals of entry of this infection are the umbilical cord at birth and the docking and castration wounds. Preventive measures include lambing sanitation, navel disinfection at birth, docking on grass if possible, and docking with the hot iron in some form."

An extreme case of urinary calculi in a lamb, J. F. BULLARD (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 5, pp. 774-776, fig. 1).—This is a contribution from the Indiana Experiment Station.

A parasitological field trial on "Gundowringa", New South Wales, 1932, I. C. ROSS and N. P. GRAHAM (*Jour. Council Sci. and Indus. Res. [Aust.]*, 6 (1933), No. 1, pp. 26-31).—This is a report of the second year's work (E.S.R., 67, p. 601) aimed at the control of losses from internal parasites of sheep.

"Corriedale ewe lambs, grazed on improved pasture, both with and without anthelmintic treatment, and with and without rotation of pastures, at the rate of 2.5 and 3 sheep per acre, respectively, made very much greater average gains

in live weight and produced from 1.75 to 2.5 lb. more wool per head than sheep on natural pastures at the rate of 1 sheep per acre. The average gain in live weight was 14 lb. per head and per acre on natural pasture; while on improved pasture, without rotation, it was 49 lb. per head and 122.5 lb. per acre, and on improved pastures, with rotation, it was 51 lb. per head and 153 lb. per acre. Sheep on natural pasture produced, on an average, 9 lb. 2 oz. of wool per head and per acre, while on improved pasture up to 11 lb. 13 oz. per head and 35 lb. per acre were produced. The sheep on improved pasture, and treated with an anthelmintic (carbon tetrachloride) at monthly intervals did not show any increase in body weight in comparison with sheep on similar pasture but not treated with an anthelmintic. The sheep on improved pasture, treated with an anthelmintic (carbon tetrachloride), showed a material increase in the weight of fleece produced per head in comparison with untreated controls. The effect of improved pastures on wool character was to produce a slight lowering in the count, but such wool was estimated to give as high, or higher, percentage clean scoured yield as that from natural pasture, and was of better staple length."

On some nematode parasites of goats and sheep at Muktesar, G. D. BHALERAO (*Indian Jour. Vet. Sci. and Anim. Husb.*, 2 (1932), No. 3, pp. 242-254, pls. 4).—Seven parasites are here considered, namely, *Varestrongylus pneu-monicus* n.g. and sp., *Dictyocaulus unequalis* n.sp., *Ostertagia orientalis* n.sp., *O. occidentalis* (Rans.), *O. circumcincta* (Stadelm.), *Haemonchus contortus* (Rud.), and *Oesophagostomum venulosum* (Rud.).

Diseases affecting moose, R. FENSTERMACHER and W. L. JELLISON (*Minnesota Sta. Bul.* 294 (1933), pp. 20, figs. 7).—The disease of moose occurring in Minnesota, reported upon by Cahn, Wallace, and Thomas (*E.S.R.*, 69, p. 110), has been studied by the authors continuously since April 1924. Their report includes a review of the literature, its history, symptomatology, post-mortem findings, blood studies, bacteriological and serological findings, and microscopic anatomy, and is followed by a general discussion.

The findings to date have been almost entirely negative so far as determining the cause of sickness and death among moose. Necropsy findings give no suggestions as to the cause of the sickness. Bacteriological findings are also negative, as are the results of animal inoculations. The possibility that the ticks may be a vector of some bacterial or protozoan disease is fully recognized. The transmission of the infection to guinea pigs and rabbits has failed.

The longevity of *Brucella suis* in artificially contaminated anti-hog cholera serum, S. E. PARK and R. GRAHAM (*North Amer. Vet.*, 13 (1932), No. 12, pp. 26-30).—In work at the Illinois Experiment Station it was found that "clear anti-hog-cholera serum (0.5 percent phenol) artificially inoculated with two *B. suis* strains (36,000 to 84,000,000 organisms per cubic centimeter) and stored at room and ice box temperatures did not yield viable *Brucella* after 8 days.

"Whole blood anti-hog-cholera serum (0.5 percent phenol), similarly inoculated (43,000,000 to 84,000,000 *Brucella* organisms per cubic centimeter), did not yield viable *Brucella* at room temperature after 45 days. *B. suis* remained viable, however, in such serum at ice box temperature for over 82 days.

"Freshly defibrinated hog blood (phenolized 0.5 percent) inoculated with *B. suis* (74,000,000 to 80,000,000 organisms per cubic centimeter) did not yield viable organisms after 11 days at room temperature. However, at ice box temperature one *Brucella* strain in these samples remained viable for 25 days."

A list is given of 14 references to the literature.

An account of the occurrence of hog erysipelas infection in New York State, D. W. BAKER (*Cornell Vet.*, 23 (1933), No. 1, pp. 66-70).—A report of cases of swine erysipelas in New York State diagnosed in December 1932.

Swine erysipelas, J. S. FULTON (*Canad. Jour. Res.*, 8 (1933), No. 4, pp. 312-316, figs. 2).—The author reports that swine erysipelas has been recognized in widely separated districts in Saskatchewan, the disease having appeared in the acute, subacute, and chronic forms. The causative organism (*Erysipelothrix rhusiopathiae*) has been isolated from a number of cases, and positive serological reactions have been obtained in others.

Idiopathic hemorrhagic hepatitis of swine, A. H. QUIN, JR., and J. D. SHOEMAN (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 5, pp. 707-717, figs. 4).—The authors report upon a peculiar etiologically obscure disease of swine which occurred in a herd in Dallas County, Iowa, in the summer of 1931. Thirty-two otherwise healthy pigs in a herd of 130 died, after an average illness not exceeding 2 days, with a disease characterized by septicemia, gastroenteritis, and hepatomegalia, with intralobular hemorrhage and necrosis. In the absence of positive bacteriological findings and negative results from inoculation of 3 cholera-susceptible pigs, the disease was classified as true toxemia of unknown etiology.

Five cases of hypertrichosis partialis in swine, H. C. H. KERNKAMP (*Cornell Vet.*, 23 (1933), No. 1, pp. 74-76, fig. 1).—This contribution from the Minnesota Experiment Station reports upon five cases of hypertrichosis partialis observed in a litter of seven pigs.

The viability of the virus of swine fever in bone marrow, muscle, and skin of preserved carcasses, T. M. DOYLE (*Jour. Compar. Path. and Ther.*, 46 (1933), No. 1, pp. 25-37).—Experiments have shown that the virus of hog cholera survived 73 days in the bone marrow of "salted" and "chilled" carcasses. The virus survived 17 days in the skin and muscle of pigs killed before the appearance of clinical symptoms. There was some evidence that virus was still present in salted muscle after 73 days. The virus survived 42 days in salted skin and muscle of pigs killed after the appearance of clinical symptoms. The virus survived for 37 days in bone marrow and muscle, and for 19 days in skin, of "smoked" carcasses.

Dissecting aneurysms in swine: A report of two cases, H. C. H. KERNKAMP (*Cornell Vet.*, 23 (1933), No. 1, pp. 76-81, figs. 2).—Contributing from the Minnesota Experiment Station, the author presents two case reports of dissecting aneurysm in swine, one a Chester White sow approximately 20 months of age, weighing 300 lb., and the other a Poland China barrow 227 days old, weighing 170 lb.

Development of the nodular worm, *Oesophagostomum longicaudum*, in the pig, L. A. SPINDLER (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 6, pp. 531-542, figs. 10).—Pure cultures of infective larvae of *O. longicaudum* were fed to pigs raised free from the parasite in order to trace its development in its definitive host. Forty-eight hours after such infestation encysted third-stage larvae were found in the colon of the experimental animal; the cysts were surrounded by areas of intense inflammation with liquefaction of tissues. "In sections the cysts, the exact nature of which has not been definitely determined, appeared to be composed of a smooth homogenous substance containing neither striations nor nuclei, and easily distinguishable from the surrounding tissue. Inflamed nodules were found in the colon of an animal which had been infected 10 days prior to post-mortem examination. Within the nodules the parasites were enclosed in cysts which were much larger than those found in the earlier stages of infection. The cyst walls appeared to be of the same composition

as those observed in the earlier stages of infection and were easily distinguishable from the surrounding fibroblasts. No decrease in thickness of the cyst walls was noted, the increase in diameter of the cysts apparently being the result of rupture by the parasites, followed by subsequent repair.

"On post-mortem examination of an animal 17 days after infection, fourth-stage larvae and early fifth-stage worms were recovered from the lumen of the cecum and large intestine. Late fourth-stage larvae were found in the nodules and in the act of emerging from the nodules, a fact which indicated that the larvae enter the lumen of the colon in the late fourth or early fifth stage of development. Nodules from which the parasites had emerged were smaller and less inflamed than those that still contained larvae. In sections, the cysts inside the empty nodules were seen to be broken, apparently having been ruptured by the parasite when it emerged.

"After the emergence of the parasites, the nodules which at first were highly inflamed and contained a central necrotic area appeared to decrease in size and in degree of inflammation. At the end of 35 days the nodules had almost completely disappeared, their location being marked, in section, by masses of connective tissue, leucocytes, and giant cells.

"Sexual maturity, as indicated by the appearance of eggs in the feces of experimentally infected animals, was reached by the parasites in 50 to 53 days after infection."

A brief description is given of the larval stages recovered from the intestines of infected animals.

Brucella abortus in the horse, H. M. DUFF (*Jour. Compar. Path. and Ther.*, 46 (1933), No. 1, pp. 42-46).—The author reports that "an organism isolated in pure culture from a withers abscess in a horse proved to be indistinguishable microscopically, culturally, and serologically from *B. abortus*. The blood serum and abscess fluid from the horse under observation agglutinated various *B. abortus* antigens up to, and including, 1 in 500. The same titer was observed when a suspension of the organism from the abscess was used. The coarse character of the culture growth and the marked tendency to agglutinate spontaneously in the presence of salt solutions seem to indicate that the organism is a rough strain of *B. abortus*."

Is there a filtrable virus of abortion in mares? (*Kentucky Sta. Bul.* 333, Sup. (1933), pp. 2).—This is a report of observations which supplement part of the account (pp. 297-301) by Dimock and Edwards (*E.S.R.*, 69, p. 111). In December 1932 and the first three months of 1933 a severe, clear-cut outbreak that resembled closely the apparently noninfectious abortion previously studied occurred on a farm near Lexington, Ky., 24 of 32 pregnant mares aborting. The period of gestation of the mares that aborted was between the seventh and tenth months, the great majority about the eighth month. The clinical condition of the mares before and after abortion, the promptness with which the majority of them returned to normal, the absence of cultivable micro-organisms, and the pathology of the fetal tissues resembled those conditions observed in previous outbreaks.

In experimental work 3 of 4 pregnant mares injected and fed material from aborted fetuses aborted. Since the period of incubation was practically the same in all cases, the results strongly indicate the presence of an infectious agent in the inoculum. Since only 1 mare was inoculated with filtrate, the result cannot be accepted as final that the abortion was directly due to the action of a filtrable agent.

Encephalomyelitis of horses in Colorado, I. E. NEWSOM (*Vet. Med.*, 28 (1933), No. 4, pp. 132-135, figs. 4).—Contributing from the Colorado Experiment

Station, the author reports that encephalomyelitis of horses, which was first recorded from the San Joaquin Valley of California in 1931 (E.S.R., 66, p. 74), has appeared in Colorado on three occasions. The details are presented in connection with a chart showing its distribution in the State in 1932.

Mosquitoes as vectors of the virus of equine encephalomyelitis, R. A. KELSEY (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 5, pp. 767-771).—The author considers the results reported, coupled with epizootological observations, to indicate that equine encephalomyelitis is naturally transmitted by insect vectors, and very probably mosquitoes. While it is understood that the particular species of mosquito (the yellow-fever mosquito) which was used in the experiments is not likely to be found in a number of the areas where encephalomyelitis has been enzootic, other species of this same genus (*Aedes*) do occur in such areas and in all probability are as capable of transmitting the disease as the yellow-fever mosquito.

Infections of fetuses and foals, W. W. DIMOCK and P. R. EDWARDS (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 5, pp. 718-725).—In a study at the Kentucky Experiment Station of "streptococci isolated from genital infections and prenatal diseases of the horse, the organisms were found to possess the characters that in the past have been generally attributed to human streptococci. The cultures were strongly hemolytic in fluid media, did not hydrolize sodium hippurate, produced only a low acidity in glucose broth, and failed to reduce methylene blue. It was found possible to differentiate 95 percent of these cultures from streptococci of human origin by their fermentative reactions. All of a series of 75 human strains were able to ferment trehalose, while they failed to ferment sorbitol. In a series of 135 equine cultures, 129 were able to attack sorbitol but failed to ferment trehalose. The 6 remaining cultures resembled the human strains in their action on fermentable substances.

"In our study of streptococci from cows, hogs, chickens, and foxes, these were found to resemble the group of equine strains described above; 95 percent of them fermented sorbitol but failed to attack trehalose. *Streptococcus equi* can be distinguished from the human streptococci and the other animal strains by the fact that it ferments neither trehalose nor sorbitol." (See E.S.R., 69, p. 111.)

Agglutinability of different strains of *Bacillus mallei*, R. N. NAIK (*Indian Jour. Vet. Sci. and Anim. Husb.*, 2 (1932), No. 3, pp. 274-277).—A study made by the author of the agglutinability of three strains of *B. mallei* failed to show any difference.

Agglutination reaction due to mallein injections in horses, R. N. NAIK (*Indian Jour. Vet. Sci. and Anim. Husb.*, 2 (1932), No. 3, pp. 265-273).—The author finds that "no sharp demarcation can be made out between the agglutination titers of serum from horses recently injected with mallein and of serum from horses infected with glanders. The presence of agglutinins induced by an injection of mallein may be found only up to about two months following the date of injection. If a healthy horse is subjected to repeated injections of mallein, the agglutination reaction simulating that of a positive case of glanders is noticeable a week after the first injection. Repeated injections of mallein do not increase the titer above that which is obtained a week after the first injection. The presence of specific agglutinins in the blood serum of horses repeatedly injected with mallein does not persist longer than three weeks after the last injection."

Necrobacillosis in the horse [trans. title], A. CLARENBURG and T. VAN HEELSBERGEN (*Tijdschr. Diergeneesk.*, 60 (1933), No. 5, pp. 240-244, fig. 1; *Ger., Eng.*,

Fr. abs., p. 244).—The authors report that upon post-mortem examination of a horse which had died they found necrotic foci in its liver and lungs, from which *Bacillus necrophorus* was isolated. It is considered probable that the infection of the liver took place from the intestine by way of the portal vein, and that the lungs became infected through the blood from the liver.

[Report of "Field" Distemper Fund] (*Field* [London], *Sup. Feb. 4, 1933*, pp. XII, figs. 36).—The contributions presented include the following: The Fight against Distemper: How It Has Been Conquered with the Assistance of the "Field" Distemper Fund, by F. Hobday (pp. I, III), and The Story of a Great Success: The "Field" Fund and Its Foundations, by E. S. Grew (pp. III, V).

The susceptibility of cloacal tissue to the virus of infectious bronchitis, C. B. HUDSON and F. R. BEAUDETTE (*Cornell Vet.*, 23 (1933), No. 1, pp. 63-65).—This contribution from the New Jersey Experiment Stations reports upon the finding of the proctodeumal tissue of the cloaca to be attacked by the virus of infectious bronchitis (E.S.R., 67, p. 747). Birds which recover from cloacal inoculation are shown to be immune to tracheal inoculation, and birds which recover from tracheal inoculation to be immune to cloacal inoculation. An account of immunization work with this disease has been noted (E.S.R., 69, p. 279).

Fowl paralysis (neurolymphomatosis gallinarum) in chicks under three months of age, J. BIELY, V. E. PALMER, and I. M. LERNER (*Canad. Jour. Res.*, 8 (1933), No. 4, pp. 305-311, fig. 1).—The authors present information on cases of fowl paralysis in which 45 out of 244 chicks developed clinical symptoms before they were 90 days of age. "Of these, 20 were inoculated and 25 were not inoculated. Forty-two of the 45 chicks (93.3 percent) showed lesions in the nervous system. Nine chicks (20 percent) showed lymphomatous tumors. Seventeen of the 45 cases (37.7 percent) occurred in chicks less than 60 days of age; the same number of cases occurred between 60 and 74 days of age; and 11 cases (24.4 percent) occurred between 75 and 89 days of age. The mean age of all chicks that developed paralysis was 64.4 days. The fact that typical fowl paralysis occurred in one chick at 37 days and in several from 40 to 44 days of age would indicate that the disease may develop at a very rapid rate."

Pullorum disease control with special reference to incubator disseminated disease, R. GRAHAM (*Vet. Alumni Quart. [Ohio State Univ.]*, 20 (1933), No. 4, pp. 177-188, figs. 2).—In summarizing this contribution, the author emphasizes the necessity in the suppression and control of incubator-disseminated pullorum disease for cooperation by veterinarians and hatcherymen in the dispatch of the following fundamental problems of poultry hygiene: (1) Elimination of pullorum disease in breeding flocks, (2) clean incubators and incubator rooms, and (3) disinfection of trays and fumigation of incubators.

A preliminary report of an apparently new respiratory disease of chickens, J. P. DELAPLANE, H. O. STUART, and H. BUNYEA (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 5, pp. 772-774, fig. 1).—The authors report upon an apparently new respiratory disease which made its appearance the latter part of June 1932 almost simultaneously in several poultry establishments in various sections of Rhode Island, the observations having been made by the Rhode Island Experiment Station and the U.S. Department of Agriculture cooperating. It was later observed in two flocks of pheasants in that State.

The disease is of a contagious nature, having spread rapidly throughout the flocks investigated. It is characterized by an exudative rhinitis and sinusitis, there having been no appreciable or consistent involvement of the larynx,

trachea, or bronchi. However, the visible membranes of the eye were subject to marked degrees of inflammation, manifested by reddening, swelling, and photophobia, with more or less profuse foamy lacrimation. In the course of one or more days, this lacrimation would give way to a sticky mucofibrinous or mucopurulent exudation, which tended to glue the eyelids. Profuse exudates of a similar character, although sometimes bloodstained, were manifested in the nasal tract and sinuses. In some few cases a generalized edema of the regions of the head and neck was noted. The subcutaneous swellings, particularly those around the eyes, were somewhat discolored, being slightly yellowish-green in character.

The incubation period in the cases observed appeared to be two or three days. The disease spread with great rapidity in infected flocks, and the death rate was high, particularly in young fowls, with the same general train of symptoms. Thus far, no pathogenic organisms capable of reproducing the disease have been isolated from the organs or air passages. A number of attempts to determine whether the virus is filtrable met with negative results. Cross-immunity tests to determine whether there was any connection between the virus of laryngotracheitis and the new disease show that fowls that have recovered from laryngotracheitis are susceptible to the new disease, and fowls that have recovered from the new disease are susceptible to laryngotracheitis. Inoculations of the pigeon, turkey, sparrow, and crow with the virus of the new disease have given negative results.

Transmissible tumors of the fowl, A. CLAUDE and J. B. MURPHY (*Physiol. Rev.*, 13 (1933), No. 2, pp. 246-275).—This contribution from the laboratories of The Rockefeller Institute for Medical Research is presented in connection with a bibliography of 15 pages.

On three species of the genus *Capillaria* from the English domestic fowl, D. O. MORGAN (*Jour. Helminthol.*, 10 (1932), No. 4, pp. 183-194, figs. 17).—The three species here reported upon are *C. longicollis* (Rud.) Trav., *C. columbae* (Rud.) Trav., and *C. retusa* (Rail.) Trav.

Chloral hydrate as a general anaesthetic for the fowl, N. HOLE (*Jour. Compar. Path. and Ther.*, 46 (1933), No. 1, pp. 47-49).—Chloral hydrate has been found useful as a general anesthetic for the fowl, its intravenous injection being simple and with no after-effects.

Arsenic poisoning in poultry, A. L. WEBER, F. R. BEAUDETTE, and C. B. HUDSON (*North Amer. Vet.*, 13 (1932), No. 12, pp. 46, 47).—Contributing from the New Jersey Experiment Stations, the authors deal with losses which occurred in a lot of 700 pullets due to arsenical poisoning that apparently was intentionally administered. Mention is also made of an additional case of poisoning in the fowl and of one which occurred in a flock of geese and chickens.

Toxicity, distribution, and excretion of thallium, P. A. SHAW (*Soc. Expt. Biol. and Med. Proc.*, 30 (1933), No. 4, pp. 488, 489).—The author has found that thallium sulfate administered by mouth to quail, geese, and ducks is fatally toxic in doses of 12, 15, and 30 mg per kilogram, respectively, calculated as thallium metal. Thallium in liver, kidney, heart, and osseous tissue was estimated to be present in a concentration approximately equal to that which had been administered. Muscular tissue was found to acquire a considerably higher concentration of thallium, but fat contained practically none. Analysis of the tissues of a goose dying 15 days after the oral administration of 20 mg per kilogram indicated a retention of from 35 to 70 percent of the thallium given.

It is concluded that while thallium is very slowly excreted and the edible tissue of birds seems to retain a relatively large amount of ingested thallium, there is no great danger that secondary poisoning in man might result from the

eating of game birds poisoned with thallium. A relatively large amount of such flesh would be necessary to contain a toxic dose of thallium for man.

Tetrameres crami sp. nov., a nematode parasitizing the proventriculus of a domestic duck in Canada, W. E. SWALES (*Canad. Jour. Res.*, 8 (1933), No. 4, pp. 334-336).—Under the name *T. crami* the author describes a new nematode parasite of the duck taken at Ottawa, Canada.

Observations on the fertility and hatchability of eggs from turkeys affected with enterohepatitis, C. F. SCHLOTTHAUER and H. E. ESSEX (*Cornell Vet.*, 23 (1933), No. 1, pp. 81, 82).—In experiments conducted at the Mayo Foundation at Rochester, Minn., to test the possibility of the transmission of enterohepatitis infection through the egg and to obtain data regarding the fertility and hatchability of eggs from known infected turkeys, it was found that 42 percent of the 62 eggs from infected turkeys were infertile as compared with 15 percent of 310 eggs from a flock of healthy turkeys. In the diseased turkeys 52 percent of the fertile eggs contained dead embryos in various stages of development as compared with 25 per cent of those from the healthy fowls. Twenty-seven percent of the eggs from the diseased hens hatched as compared with 63 percent from the healthy hens.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Maine Station] (*Maine Sta. Bul.* 363 (1932), pp. 265, 266, 294-296, fig. 1).—The results of examinations of gasolines and motor oils, by J. M. Bartlett, C. H. White, and B. E. Plummer, and brief descriptions of a cold storage for apples at the Highmoor Farm and a greenhouse at the main station are presented.

[Irrigation investigations in Oregon] (*Oregon Sta. [Pamphlet, 1933]*, p. 12; *Branch Sta. [Pamphlets, 1933]*—*Harney Sta.*, pp. 3, 4, 6, fig. 1; *Umatilla Sta.*, pp. [2-4]).—These pamphlets report briefly the outstanding accomplishments resulting from irrigation investigations at the main station; results of experiments on an irrigated 80-acre farm unit under pump and duty of water experiments with several grain, forage, and truck crops at the Harney Substation; and results of studies with strip border method of irrigation and of lysimeter tests at the Umatilla Substation.

Computing the effective diameter of a well battery by means of Darcy's law, O. L. ELIASON and W. GARDNER (*Agr. Engin.*, 14 (1933), No. 2, pp. 53, 54, figs. 3).—In this mathematical contribution from the Utah Experiment Station, an attempt is made to compute the effective diameter of a battery of wells penetrating a uniform horizontal stratum of water bearing gravel bounded above and below by impervious layers with the water pumped from such depth as to insure horizontal movement.

Water power on the farm, D. S. WEAVER (*North Carolina Sta. Agron. Inform. Circ.* 74 (1932), pp. 6, figs. 3).—Practical information is given on how to develop and utilize water power on farms in the Piedmont and Mountain sections of North Carolina.

Some soil factors affecting erosion, L. D. BAVER (*Agr. Engin.*, 14 (1933), No. 2, pp. 51, 52).—In a contribution from the Missouri Experiment Station an analysis is given of the soil factors affecting erosion, including absorptive capacity for water, permeability of soil profile, ease of dispersion, size of particle, and degree of aggregation. From this analysis a mathematical expression of erosion as a function of soil properties is derived $E = \frac{K D}{A P p}$ in which E is erosion, K is a constant of proportion, D is the ease of dispersion, A is absorptive capacity, P is permeability, and p is size of particle.

Data are reported on the effect of a legume in the rotation in the control of erosion between terraces.

Soil erosion control by terracing—history and accomplishments, C. E. RAMSER (*Agr. Engin.*, 14 (1933), No. 4, pp. 103, 104, fig. 1).—In a contribution from the U.S.D.A. Bureau of Agricultural Engineering the history and accomplishments of terracing as an erosion control measure are briefly summarized.

The results given in this article on soil erosion control are by no means conclusive, but the data so far collected clearly indicate that terraces well designed and well constructed are very effective in reducing the rate of soil erosion.

Protective coverings for rammed earth walls, R. L. PATTY (*Agr. Engin.*, 14 (1933), No. 3, p. 70, figs. 2).—Studies conducted at the South Dakota Experiment Station are briefly reported. It was found that rammed earth walls can not only be painted satisfactorily within three days after being rammed, but that painting at that time is very desirable. So far this study has shown that the blocks painted immediately do lose their moisture but at a slower rate.

Efficiency tests of tractor wheels and tracks, E. V. COLLINS (*Agr. Engin.*, 14 (1933), No. 2, pp. 35–38, figs. 7).—Studies conducted at the Iowa Experiment Station on the performance of tractor wheels and tracks over their normal working range as means of converting power from the final drive shaft to the drawbar are reported.

In the tests of tractor tracks the equipment used consisted of a Caterpillar 20 tractor with a recording and integrating dynamometer built into the front support for the engine and transmission, which are of unit construction. The dynamometer car used for providing a load for these tests has a pair of guide wheels in front and tracks in the rear. A large rotary pump which provides the necessary resistance to travel is geared to the tracks. The valve of the pump is operated automatically to provide a constant drawbar pull. The hitch is connected directly to a large piston working against oil pressure provided by a second pump. A relief valve set to give the desired pressure on the piston by-passes the surplus oil back to a reservoir. In this way a constant pressure is maintained on the piston attached to the hitch.

The efficiency curves for four different heights of hitches for pulverated soil show the advantage of a low hitch. This held true for all conditions tested except hard cinders where the 12-in. hitch gave the best results. Perhaps in this case more penetration of the hard surface was secured by tilting the tracks up slightly. Other tests made indicated that used tracks had less friction than new ones, and that at least half the rolling resistance would be saved if the track were laid out for it instead of having to pick up and relay its own track.

In the tractor wheel tests a John Deere Model D tractor was selected because the design of the final chain drive appeared to offer an excellent opportunity to attach an input measuring device. In this case an integrating dynamometer was used to measure the tension in one of the final drive chains. With this tractor, using 46 by 11 in. wheels and 5-in. spade lugs, the higher hitches gave the best results.

Ohio tests of rubber tractor tires, G. W. McCUEN (*Agr. Engin.*, 14 (1933), No. 2, pp. 41–44, figs. 7).—Tests of rubber tractor tires conducted at the Ohio Experiment Station are reported. The purpose was to ascertain the relative efficiencies of the same tractor when equipped with regular wheel equipment and low-pressure tire equipment. The steel wheels were the standard

42 by 11 $\frac{1}{8}$ -in. wheels with 6-in. spade lugs on the rear and 28 by 4 plain band type in front. The rubber equipment consisted of Firestone 11.25-24 pneumatic tires on the rear and 6.50-16 on the front. The rear tires were inflated to 12 lb. and the front tires to 16 lb. pressure.

At normal working loads the rubber tractor tires in second gear required an average of only 91 percent and in third gear only 75.5 percent as much gasoline per drawbar horsepower as the steel wheels in second gear. The greater efficiency of the rubber tires makes it practical to do work in third gear which could be done only in second or first gear with steel wheel equipment. Under all conditions tested the rubber tractor tires developed a greater effective drawbar pull than the steel wheels with lugs. The low-pressure tractor tires gave a higher average speed than steel wheels. For the same effective drawbar pull the average increase in speed on sod in one series of tests was 36.7 percent and on plowed ground 25.9 percent. This higher speed would of course result in a corresponding saving in time.

The rolling resistance of the tractor when equipped with low-pressure tractor tires on sod is 31.4 percent and 54.1 percent of that of steel wheels. This low rolling resistance is a large influencing factor in a greater efficiency of the tractor. The power of the engine is not consumed to so large a degree in the propelling of the unit but is delivered to the drawbar as useful work.

A greater efficiency of the tractor was obtained when pneumatic tractor tires were used as wheel equipment for plowing. This increased efficiency was a result of lowering the fuel consumed per acre plowed 23.83 percent and increasing the area plowed by 27.2 percent in the same unit of time.

Drilling powdered agricultural limestone, W. A. ALBRECHT and M. M. JONES (*Agr. Engin.*, 14 (1933), No. 4, pp. 106, 107, fig. 1).—The results of experiments conducted at the Missouri Experiment Station are briefly reported. These indicate that the internal double-run type of force feed will drill fine limestone when a suitable agitator is used in the drill hopper. They also indicate that present drilling machinery will distribute the finely powdered limestone effectively and in rates that easily accommodate the amounts suggested by soil experiments with this fine limestone.

Recent cotton ginning investigations, C. A. BENNETT (*Agr. Engin.*, 14 (1933), No. 3, pp. 74-76, figs. 2).—This is a summary of some of the more important features of the cotton ginning investigations being conducted at the Mississippi Delta Branch Station by the U.S.D.A. Bureau of Agricultural Engineering. The results are taken to indicate that there is ample foundation for the use of the plain single-rib gin in many localities, and especially for the longer staples where the cleaning and extracting is performed prior to the actual ginning.

A grain combine for the Corn Belt, I. D. MAYER (*Agr. Engin.*, 14 (1933), No. 4, pp. 91, 92, 96, figs. 2).—This contribution from the Indiana Experiment Station directs attention to some of the difficulties which have been experienced with the combines now in use in this region, and sets out some of the requirements which a combine should fulfill in order to be a satisfactory machine for Corn Belt conditions.

It has been found that the combine desired by the farmers of the Corn Belt is one with great flexibility. It should be capable of harvesting a great variety of crops; it should have a wide cutting range; it must have sufficient capacity to handle long and coarse-strawed grain; it must be strong and durable, yet relatively light in weight so that it can be pulled over soft fields by the medium size of tractor; it should be capable of quick, easy transportation

from field to field; and it should be a simple machine which can be kept in adjustment and repair by the farmer.

A cost study of filling silos with the field ensilage harvester, P. I. WRIGLEY and A. W. CLYDE (*Agr. Engin.*, 14 (1933), No. 4, pp. 97, 98, 100, figs. 2).—Studies conducted at the Pennsylvania Experiment Station are briefly reported.

Practically no difference was found between the corn binder and the field silage harvester, either in the amount of corn cut per hour while in operation or in the horse labor required. The harvester saved the work of the man on the corn binder and of the four men who put the bundles of corn on the wagons for the time required to fill the silos. This amounted to approximately 0.75 man hour per ton. To offset this there was a difference in interest, depreciation, repairs, gasoline consumption, and size of tractor required in favor of the cheaper outfit. The value of the extra gasoline, oil, tractor hire, and grease used by the harvester minus the cost of the twine used by the binder was 2.9 c. per ton.

The mower-crusher in hay making, F. J. ZINK (*Agr. Engin.*, 14 (1933), No. 3, pp. 71-73, figs. 7).—The results of tests of the mower-crusher in hay making are reported which were conducted at the Kansas Experiment Station.

The cutting is done by means of a standard mower cutter bar, and the mat formed by the cut swath is elevated and passed between two rollers, which are held in contact with each other by means of springs. The rolls are the same length as the cutter bar. One of the rolls is made of steel, while the other is of steel covered with rubber. After passing between these rolls the hay is dropped to the ground to dry in the usual manner. Power to drive the rolls of the machine is supplied by means of a power take-off shaft from the tractor.

The results indicate that there is apparently a practicable application for the mower-crusher in ordinary haying practice. Under eastern Kansas conditions the rolling process appears to insure a moisture content sufficiently low to permit placing alfalfa hay into storage the same day that it is cut. The rolling process increases the drying rate by stem bleeding and by increased evaporation through the stem fractures. The process provides for a more equal drying rate of leaves and stems, and should prevent leaf losses which are due to the leaves becoming overdry.

Recent developments in stationary spray systems in West Virginia, F. D. CORNELL, JR. (*Agr. Engin.*, 14 (1933), No. 3, pp. 78, 80, figs. 2).—In a contribution from the West Virginia Experiment Station a brief summary is given of recent developments and improvements in stationary spray systems.

Corn borer control with farm machinery, H. N. WORTHLEY and R. U. BLASINGAME (*Pennsylvania Sta. Bul.* 284 (1933), pp. 19, figs. 9).—Studies of corn borer control by the use of machinery are reported, which were conducted in cooperation with the U.S.D.A. Bureau of Agricultural Engineering.

It was less expensive to husk corn from the standing stalks than to cut it, but standing stalks and tall stubble could not be plowed cleanly enough to avoid the hand picking of borer-infested stalks from the surface of plowed ground. Where standing stalks were successfully poled down, while frozen, raked up, and burned, further corn borer control efforts were unnecessary. The cost of these extra operations was nearly balanced by the saving of plowing time in the poled areas. The stalk shaver will doubtless be more generally useful than a drag to break down standing stalks.

It was less expensive to cut corn with a tractor-drawn binder than by hand. A binder hitch causing one tractor wheel to crush a stubble row was an aid to clean plowing. A stationary-knife low-cutting binder performed as well as

a standard binder except in shallow-rooted, drought-stricken corn. It left stubble too short to harbor many borers and saved considerable silage. A husker-shredder saved cost in handling the corn crop and shredded the stalks fine enough to kill borers contained in them. Improved effectiveness of the 14-in. general-purpose walking plow resulted from the addition of a looped chain and wire.

In 7 out of 8 direct comparisons the walking plow equipped with chain and wire gave better coverage of standing stalks than tractor plows with standard equipment. In 10 out of 12 direct comparisons tractor plows equipped with experimental covering devices gave better coverage than the walking plow. However, in ledgy places the walking plow could be operated, while tractor plows had to be lifted from the ground. Width, weight, and beam clearance were important factors in the performance of tractor plows.

Among the covering devices tested, a floating colter, a fixed wide jointer, and a floating trash shield gave sufficient promise to warrant their further development and adaptation to existing makes of tractor plows.

[Rural electrification investigations at the New Hampshire Station] (*New Hampshire Sta. Bul.* 270 (1933), p. 14).—The total electrical load used on seven experimental farms is analyzed by W. T. Ackerman.

A study of temperatures in dairy stables, M. A. R. KELLEY (*Agr. Engin.*, 14 (1933), No. 2, pp. 47-49, fig. 1).—Studies conducted by the U.S.D.A. Bureau of Agricultural Engineering in cooperation with the Wisconsin Experiment Station are reported, the purpose of which was to study the effect of different stages of stable temperatures and of sudden changes in temperature and the consequent necessity of insulating dairy barns as a factor in temperature maintenance and maximum milk production.

In these tests ventilation was regulated so as to aid in maintaining the desired temperatures and at the same time avoid bad stable air conditions. Heat was available to raise stable temperatures when necessary. On several occasions excessive drafts resulted when an attempt was made to hold stable temperatures lower than outside conditions warranted. As the results of these excessive drafts several cases of pneumonia developed. The same results were obtained both winters.

It was found that if adequate ventilation is maintained the effect of relative humidity upon the cows is not apparent generally under winter stable conditions, and it is not until the temperatures exceed 75° F. and are combined with the high humidities that their results become apparent. The upper limits of 80 percent humidity is prescribed and can be obtained with adequate ventilation, while the relative humidity of the stable will rarely go below 40 and seldom below 50 percent. During the tests a stage of approximately 70 percent was obtained with a small variation above and below. Thus in this prescription is assumed a practical limitation rather than the specific effect on comfort.

Stable temperatures ranging from 40° to 65° in stages of 5° were studied in the test barn. Temperatures in a second barn were permitted to vary with the weather, and these results checked against the records of 90 farm barns with a personal check on 50 of these. Sufficient data were obtained to prescribe a zone of comfort for the dairy cow.

In comparing cows in sections held at from 50° to 55° it was noted that they were more alert, eyes brighter, hair more glossy, and appetite good, while those in sections having temperatures of 60° and 65° stood with ears back, were more restless, had harsh hair, were harder to clean, and had less appetite. At the higher temperature odors were more noticeable, and health inspectors

objected to these. The milkers all preferred the cooler temperatures (50° to 55°).

The heat production of poultry under housing conditions, H. GIESE and F. J. McCORMICK (*Agr. Engin.*, 14 (1933), No. 3, pp. 67-70, figs. 8).—Studies conducted at the Iowa Experiment Station are reported.

The experiments were conducted with a battery of 10 insulated airtight pens, which were constructed in two tiers of 5 pens each. Each pen was 7 by 5.5 ft. in plan and 3.5 ft. in height. This allowed each bird 3.85 sq. ft. of floor space, as 10 White Leghorn birds were confined in each pen. This battery was entirely enclosed within another building to eliminate the effect of sunlight. Illumination was provided for 12 hours each day by automatically controlled incandescent lamps. The vitamin D deficiency was compensated by feeding cod-liver oil. For the operation periods the air supply was controlled for only 5 of the 10 pens, the others being open to natural ventilation.

The carbon dioxide determinations were made with a Peterson-Palmquist apparatus modified to permit the analysis of air with a very high CO₂ content, such as encountered in these experiments. Air samples were taken through a long glass tube introduced through a small opening in the front of the pen. Relative humidity determinations were made with a psychrometer of special design, such that the wet-and-dry bulb temperatures might be read through a 2-in. diameter opening in the front of the pen without removing any of the air from the pen. A thermometer was hung in each pen from which readings were recorded at 8 a.m. and 4 p.m. daily. The temperature in the surrounding building was also recorded at these hours.

The data secured indicate that heat produced by a chicken varies within wide limits, depending upon environmental conditions. More specifically, the heat production is influenced by thermal characteristic (*C*) of pen or house, and by the outside temperature (*t*), the heat production increasing with an increase in *C* or a decrease in *t*. It is believed that the thermal characteristic may be closely approximated for any given pen or house, and thus the heat which is required of the birds can be estimated for an outside temperature within the range of the studies.

A homemade brick brooder, D. S. WEAVER and C. F. PARRISH (*North Carolina Sta. Agron. Inform. Circ.* 76 (1932), pp. 4, figs. 6).—Practical information is given on the construction of a home-made brick brooder, together with working illustrations.

AGRICULTURAL ECONOMICS

[**Investigations in agricultural economics**] (*Jour. Farm Econ.*, 14 (1932), No. 4, pp. 679-700, fig. 1).—Notes are included on the following investigations and subjects: The Influence of Spanish and Mexican Land Grants on California Agriculture, by R. H. Allen (pp. 679, 680); Problems in Using County Records in Farm Mortgage Research, by W. G. Murray (pp. 681, 682); Marketing Virginia Farm Flock Eggs on a Graded Basis, by G. H. Ward (pp. 683-685); Changes in Farm Tenancy during Fifty Years, by O. M. Johnson (pp. 685-687); Correct Accounting Principles in Connection with the Payment of Construction Costs on Federal Irrigation Projects, by L. H. Hauter (pp. 687-690); Some Problems in Studying Farm Expenses, by L. F. Garey (pp. 690-692); The California State Water Plan, by G. S. Wehrwein (pp. 692-695); Volume of Farm Mortgage Indebtedness, by D. L. Wickens (pp. 696, 697); and Minnesota Farmers' Response to Price Relationships in the Production of Selected Crops, by R. W. Cox and P. E. Quintus (pp. 697-700).

[Papers presented at the twenty-third annual meeting of the American Farm Economic Association] (*Jour. Farm. Econ.*, 15 (1933), Nos. 1, pp. 1-163, fig. 1; 2, pp. 217-387, figs. 16).—Included are the following papers and discussions thereon presented at the meeting held at Cincinnati, Ohio, December 28-30, 1932: Taxes a Cause of Agricultural Distress, by B. H. Hibbard (pp. 1-13); Farm Mortgage Delinquencies and Foreclosures, by R. M. Green (pp. 14-26); Elements Contributing to Farm-Mortgage Debt Distress, by D. L. Wickens (pp. 27-33); Outlook for Farm Mortgage Debt and Plans for Handling It, by F. F. Hill (pp. 34-56); The Extent, Character, and Future of the New Landward Movement, by P. K. Whelpton (pp. 57-72); Recent Developments in Professional Farm Management in the United States, by D. H. Doane (pp. 73-81); Changes in Organization and in Farm Practices That Have Recently Been Effective on Professionally Managed Mid-West Farms, by W. W. McLaughlin (pp. 82-88); Recent Changes in Organization and Farm Practices, by H. Burr (pp. 89-94); Farm Management, Organization, and Practice, by F. W. Reinoehl (pp. 95-102); Changes in Farm Organization and Practices, by L. H. Woodhouse (pp. 103-110); Changes in Organization and Farm Practices, by E. Walley (pp. 111-116); Adult Education of Farmers in Economics, by A. W. Manchester (pp. 117-125); Programs of Adult Study of Taxation, by H. Howe (pp. 126-133); Methods of Adult Education in Price Economics, by C. R. Arnold (pp. 134-140); Practice and Theory of Market Exclusion Within the United States, by L. Spencer (pp. 141-163); A Land Use Program for the Federal Government, by M. L. Wilson (pp. 217-235); Land Use Planning by the States, by R. Zon (pp. 236-242); State Land Use Commissions and Programs of Land Use, by C. E. Ladd (pp. 243-246); An Evaluation of the Present Economic Position of Agriculture by Regions and in General—I, Prices of Farm Products, by J. S. Davis (pp. 247-259), and II, Farm Real Estate Values, by E. H. Wiecking (pp. 260-272); The Nature and Possibilities of Type-of-Farming Readjustment Programs, by L. G. Allbaugh (pp. 273-284); The Technique of Assisting Farmers in Individual Farm Adjustments, by L. M. Vaughan (pp. 285-293); Technique of Extension Use of Material from Farm Accounting Associations, by R. R. Hudelson (pp. 294-309); Developments with Respect to Short-Term and Emergency Agricultural Credit, by N. J. Wall (pp. 310-318); Reorganizing Our Agricultural Credit Facilities, by F. Baird (pp. 319-330); Short-Term Borrowing Policies of Farmers, by V. B. Hart (pp. 331-348); Measuring the Effect of Supplies on Prices of Farm Products, by L. H. Bean (pp. 349-377); and The Nature of Statistical Supply Curves, by J. M. Cassels (pp. 378-387).

[Investigations in agricultural economics] (*Jour. Farm Econ.*, 15 (1933), No. 1, pp. 164-180).—Notes are included on the following investigations and subjects: The Economic and Historical Background of Farm Tenancy in Delaware, by R. O. Bausman (pp. 164-167); An Analysis of Real Estate Problems of the Minnesota Department of Rural Credits, by A. True (pp. 168-171); Variations in Market Preferences for Hogs, by I. W. Arthur (pp. 171-174); A Comparison of Sale Values of Farm Real Estate and Census Values in Minnesota, by E. C. Johnson (pp. 174-177); Import Quota System in Germany, by H. A. Wadsack (pp. 177-179); and The Electrification of the Village in Czechoslovakia, by S. Borodaewsky (pp. 179, 180).

[Papers on agricultural economics] (*Assoc. South. Agr. Workers Proc.*, 32 (1931), pp. 225-274).—Included are the following papers read at the convention of the Association of Southern Agricultural Workers held at Atlanta, Ga., February 4-6, 1931: The Content of the Agricultural Marketing Course, by J. G. Knapp (pp. 225-233); Inadequacy of Cost-of-Living Figures as Measures of

Standard of Living, by C. E. Allred (pp. 234-242); What Is New in Farm Management Research Methodology? by C. L. Holmes (pp. 242-246); Present Status of the Cooperative Marketing of Cotton, by J. S. Hathcock (pp. 246-259); Methods of Extending Results of Farm Management Research, by V. B. Hart (pp. 260-263); Farm Credit in the South, by D. L. Wickens (pp. 264-268); and Economic and Social Position of the South, by S. H. Hobbs, Jr. (pp. 269-274).

Proceedings of Western Farm Economics Association, 1932 (*West. Farm Econ. Assoc. Proc.*, 6 (1932), pp. [4]+[123], figs. 8).—Included are the following papers presented at the sixth annual conference held at Salt Lake City, Utah, August 9 and 10, 1932: The Problem of Credit to Be Used in Current Agricultural Production, by M. R. Benedict (pp. 1-4); The Farm Mortgage Situation, by R. L. Adams (pp. 5-13) (see below); Present Problems of Re-financing Irrigation Districts, by W. A. Hutchins (pp. 14-22); Agricultural Financing: An Example of an Organization Plan for Agricultural Financing, by L. E. Cline (pp. 23-33); Grazing in Relation to Land Planning, by W. Peterson (pp. 34-41); Agricultural Production and Land Utilization, by A. F. Vass (pp. 42-55); The Interrelation of Farm Management Research with Other Phases of Agricultural Economic Research, by E. A. Starch (pp. 56-59); A Practical Method of Establishing Uniform Units for Cattle Ranch Costs, by C. A. Brennan (pp. 60-64); Farm Management, a synopsis of papers presented and discussed at the conference, by R. L. Adams (pp. 65-68); Farm Relief Measures, by C. C. Conser (pp. 69-72); Economic Planning as Applied to Agriculture, by M. L. Wilson (pp. 73-79); The Possibilities of Economic Planning, by P. A. Eke (pp. 80-85); The Limitations to Social Economic Planning, by G. M. Peterson (pp. 86-97); Limitations to Economic Planning, by E. F. Dummeier (pp. 98-100); and Summary and Discussion on Economic Planning, by E. W. Braun (pp. 101-104).

Also included are the resolutions passed by the association suggesting action in improving the position of agriculture in the Western States (pp. 112-114); and a paper on Relation of Watershed to Cultivated Land Planning, by C. L. Forsling, delivered at the Western Outlook Conference held at Salt Lake City, August 10 and 11, 1932 (pp. 118-[123]).

The farm mortgage situation with special reference to the eleven Western States, R. L. ADAMS (*Jour. Farm Econ.*, 14 (1932), No. 4, pp. 605-614).—This article outlines the change in the mortgage situation in the 11 States and the problems arising out of the increase in delinquencies. Comments are made on the policies of foreclosure, of farming lands acquired through foreclosure, and of selling such lands. Some remedies for the situation are suggested.

[Papers presented at the annual meeting of the [British] Agricultural Economics Society] (*Jour. Proc. Agr. Econ. Soc.*, 2 (1932), No. 1, pp. 10-70).—Included are the following papers and discussions thereon presented at the meeting held at Cambridge, England, June 26-29, 1931: The Adjustment of Agriculture to Industrial Rationalisation, by D. H. Macgregor (pp. 10-28); A Farmer's Interpretation of Agricultural Accounts, by W. G. Coates (pp. 29-42); Some Aspects of Meat Distribution and Consumption, by A. Jones (pp. 43-61); and A Contribution to the Study of Occupational and Residential Mobility in the Cotswolds, 1921-1931, by M. A. Abrams (pp. 62-70).

[Investigations in agricultural economics at the Maine Station, 1931-32] (*Maine Sta. Bul.* 363 (1932), pp. 233-246, figs. 6).—Included are results of investigations of prices and price trends of farm products, by C. H. Merchant (pp. 233, 234); of farm taxation, by Merchant and M. S. Parsons (pp. 234-236), including charts showing the relation for the period 1913-31 of prices of farm

products and farm real estate taxes in Maine, and the index numbers of State, county, and municipal taxes on real and personal property; of production and utilization of milk in Maine, by G. F. Dow (pp. 236-241), including charts and tables showing for 1928 the proportions of total production, by counties, sold to larger dealers and smaller retailers and used or made into butter on the farm, the percentages of butterfat sold as milk and as cream when different amounts of butterfat were sold per 100 acres of land, the variation in sales per month of milk and of cream sold to dealers compared with dairymen's sales in New York in 1928 and in Vermont in 1929, and the plant utilization by months of butterfat received by the larger Maine dealers in 1928; of the potato industry in Maine, by W. E. Schrupf and Merchant (pp. 241-243), giving some preliminary comparisons of labor income, acreage yields, and man labor costs on two groups of farms; and of the factors affecting the quality of Maine potatoes, by Schrupf (pp. 243-246), including findings as to the percentages of major and minor cuts and bruises due to different causes.

[**Investigations in agricultural economics at the New Hampshire Station, 1931-32**] (*New Hampshire Sta. Bul.* 270 (1933), pp. 8, 9-11, 13, 14).—Brief reports are made of the following investigations: A study of milk-marketing costs in Laconia, by E. H. Rinear and H. C. Moore; a survey of the town of Dorchester, by H. C. Woodworth, M. F. Abell, et al., showing the utilization of lands, with special reference to timber; a study, in cooperation with the U.S. Department of Agriculture, of the decline, 1930 to 1932, in farm labor incomes on 38 Grafton County dairy farms, by Woodworth, C. W. Harris, Jr., and E. Rauchenstein; a study of roughage production, by Abell, on 328 farms, of which 281 grew silage; fruit farm organization studies, by Woodworth and G. F. Potter; and a study by H. R. Francis of the possibilities of the use of abandoned farm lands for recreational purposes in the town of Sandwich.

[**Twentieth annual report of the Agricultural Economics Research Institute, University of Oxford**] (*Univ. Oxford, Agr. Econ. Res. Inst. Ann. Rpt.*, 20 (1932), pp. 23, pls. 3).—Included are descriptions of the research, advisory, and educational work done by the institute and a list of its publications during 1932.

Long-term farm credit in a depression, D. L. WICKENS (*Jour. Farm Econ.*, 14 (1932), No. 4, pp. 615-629, figs. 3).—The first part of this article discusses the changes that have taken place in the farm mortgage situation, including tables showing for selected years from 1890 to 1930, usually census years, data as to volume of indebtedness; percentage of owner-operated farms mortgaged, average debt, farm price, and ratio of debt to such farms; percentage mortgage credit is of value of all farms; ratio of mortgage debt to value of mortgaged farms by ratio groups; number of farms owned by Federal land banks and joint-stock land banks (1929, 1930, and 1931); percentage of farms foreclosed of all farms, by years 1926-31; percentage of farms foreclosed during the period 1920-23 and by years 1925-26 to 1929-30; percentage distribution of debt to value of mortgaged farms, January 1932, by geographic divisions; the distribution, 1929, 1930, and 1931, of new loans by methods of payment provided for; and the gross farm income of the United States, by years 1924-31.

The second part discusses the strength and weakness of the various agencies as sources for farm mortgage credit as demonstrated by the normal and abnormal conditions that have existed. The author states that "each of the principal lending institutions providing long-term farm credit has been found to have imperfections for supplying the financing demands of agriculture. In consequence of the severe restrictions on access to outside sources of funds during periods of high rates, the market is either shut off from farmers or it is

forced back in some degree to the simpler but less satisfactory procedure prevailing in pre-war years in which individual borrower and lender undertake to find mutually agreeable amount, term, rate, and other loan conditions. . . .

"The depression has shown more clearly that further progress in farm mortgage finance requires greater reliance upon institutions functionally adapted to the nature of the responsibility, the elimination of arbitrary loaning restrictions which have no basis in economic experience, and general recognition of the necessity of abandoning short-term viewpoints and measures in dealing with a long-term problem. This depression has demonstrated again the futility of legal regulations restricting interest rates to an arbitrary maximum under all conditions; that such provisions during periods of money strain must result in occasional serious interruptions in loan service and the limiting of operations at all times to a group of conditions narrower than economically desirable."

Farm mortgage experience of life insurance companies lending in South Dakota, H. A. STEELE (*South Dakota Sta. Circ. 7 (1932), pp. 40, figs. 15*).—This circular is based on annual statements of life insurance companies lending on farm mortgages in South Dakota filed with the South Dakota Commissioner of Insurance and the Minnesota Department of Insurance, reports of the New York Insurance Department, and Federal Census reports. Tables, charts, and maps are included and discussed showing, among other data, the amount of farm mortgages in South Dakota owned on December 31, 1930, and December 31, 1931, amounts loaned and payments received during the year for each of 36 life insurance companies loaning in the State. Similar data, except for mortgages owned December 31, 1930, are given for 7 other companies.

Forty-three life insurance companies held \$106,075,480 in farm mortgages in the State on December 31, 1931. All real estate owned by 40 companies constituted 3 percent of their total assets. Insurance companies on December 31, 1931, owned 440,095 acres of farm real estate in South Dakota. They reported 4,479 loans with a total principal of \$31,173,800 or 29.4 percent of their total farm mortgage investment on which the principal, interest, or taxes were delinquent for over three months. Farm mortgage loans in the course of foreclosure represented about 8 percent of the total of such loans. The average rate of interest on the delinquent loans was 5.4 percent, and the term for 43 percent of such loans was 5 years. During the year 1931, the insurance companies made 56 outright sales and 24 sale contracts on farm real estate in the State.

Measures taken in foreign countries to relieve agricultural indebtedness, compiled by A. M. HANNAY, M. COULT, and L. CRANS (*U.S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 42 (1933), pp. [3]+57*).—Included are 127 annotated citations, mostly referring to the present depression, arranged by countries.

Taxation in Maryland with special reference to agriculture, W. P. WALKER and S. H. DEVAULT (*Maryland Sta. Bul. 339 (1932), pp. 261-342, figs. 6*).—The taxable wealth of the State, sources of State and county tax revenues, the administration of assessments, the general property tax and assessment procedure, the distribution and increase of State and county expenditures, expenditures for education and roads, and the bonded indebtedness of the State and counties are described and discussed.

Data were obtained for 1,000 farms in 11 counties regarding assessments for land, buildings, and personal property for the years 1910 to 1927. These are analyzed by periods, size of farms for 1927, type of land and range in assessment for 1917, 1922, and 1927, and by rates of State and county taxes for 1910, 1917, 1922, 1927, and 1932. Other tables show the approximate taxes per farm

and per acre, by years 1911-32, on real estate and personal property. The farm tax burden is discussed with tables showing the relation of taxes per acre, prices of farm products, and value of farm real estate; amounts of different farm products required to pay the general property tax per farm in 1911, 1915, 1920, 1925, and 1931; and the relationship of average farm income and general property taxes, 1929-31, in the Piedmont-Plateau and Eastern Shore areas of the State. Tables and charts show the amounts raised by different State and county taxes in 1932 and the purposes for which these funds were used.

State income taxation, special commodity taxes, gasoline taxes and motor vehicle licenses, and the inheritance and gift tax are discussed, with estimates as to the probable revenues to the State from those not in use at present.

In 1931, general property taxes represented 25 percent of the State tax revenue, licenses and nonbusiness taxes 59 percent, and other taxes 17 percent. About 95 percent of the county revenue was derived from general property taxes. An analysis of 1,546 property sales in 6 counties from 1927 to 1931 showed that the average assessments in the different counties varied from 82 to 110.9 percent of the sale value for the farm properties and from 59.1 to 75.8 percent for the town properties. Assessments on properties selling from 1918 to 1931 for less than \$1,000 averaged 92.1 percent for farm and 76.2 percent for town properties, as compared with 76.4 and 61.2 percent, respectively, for those selling for \$1,000 to \$5,000 and 56.7 and 54.5 percent, respectively, for those selling for over \$5,000.

State expenditures increased over 231 percent from 1915 to 1931, about 29 percent of the increase being due to roads and 25 percent to school costs. The levy of 7 counties increased over 430 percent from 1899 to 1932, of which increase schools accounted for 53 percent, debt for 13 percent, and roads for 10 percent. In 1931, 26 percent of the current State expenditures went for public schools and 22 percent for highways. In the 7 counties studied, about 48 percent was for schools and about 12 percent for roads in 1932. Debt requirements of the counties of the State in 1932 varied from 2.2 to 36.3 percent of the tax levies.

For the 1,000 farms studied, taxes increased from 34 c. per acre in 1911 to 90 c. in 1928, then declined to 84 c. in 1932. Farm taxes in the State in 1932 were 148 percent higher than in 1911-13, while the prices of farm products were 15 percent lower. Taxes absorbed 10 percent of the farm income of 282 Piedmont area farms studied in 1929 and 34 percent in 1931, and 7 percent of the farm income of 267 Eastern Shore farms studied in 1929 and 53 percent in 1931. Of taxes paid by farmers of the State in 1932, about 69 percent were county and 31 percent State taxes.

The following recommendations are made as a result of the study: Continuous assessment should be made by full-time, well-trained, and well-equipped assessors rather than periodical assessments as at present. Farm land and buildings should be assessed as a unit, the proportion of the assessment for buildings used for agricultural purposes being based upon the value they add to the land. A better classification and assessment should be made of woodland in counties using a uniform assessment of such land on the basis of age and condition and with a view to encouraging reforestation. More uniformity should be adopted among the counties as to methods and time of collecting taxes, especially delinquent taxes. A temporary curtailment should be made in the State road building program, and part of the gasoline tax and motor vehicle license fund should be used for maintenance or road debt; county road construction programs should be designed to extend facilities to the greatest

number of rural people and to build lower-cost roads where the traffic does not justify a large investment per mile; county gasoline tax and motor vehicle license revenues should be spent only for road purposes; and license fees for motor trucks should be increased upon the basis of horsepower, weight, and capacity. There should be greater State aid to schools so that counties and cities should not be required to levy more than 40 c. per \$100 valuation for current school expenses, and a sales tax should be applied to luxuries or other indirect taxes used to raise money for State aid to local governmental units for their school program. An income tax law should be enacted to replace in part the local general property tax; the present inheritance tax should be extended to include taxation of transfers to members of the immediate family; and the taxation of transfers of property by gift should be made on the same basis as transfers by inheritance.

A method for the classification of rural lands for assessment in western North Dakota, C. E. KELLOGG (*Jour. Land and Pub. Util. Econ.*, 9 (1933), No. 1, pp. 10-15, figs. 2).—This article points out the requirements of a workable method of classifying rural lands for tax assessment and describes the method being used in McKenzie County, N.Dak., in which the classification for each 40-acre unit is based on a detailed survey of soils, lay of the land, stoniness, drainage ways, etc., and the accumulated experience in the utilization of various types of land.

Changes in the tax system relating especially to forests: Conclusions and recommendations (U.S. Dept. Agr., Forest Serv., *Forest Taxation Inq. Prog. Rpt.* 18 (1933), pp. [6]+60, figs. 2).—This is an advance publication of a portion of the final chapter of a report on forest taxation. Included are the conclusions as to uniform fixed assessment and specific taxes, classification according to the owner's intended use, optional v. compulsory laws, contracts, and separation of land and timber value. Four forest tax plans—the adjusted property, the partial timber exemption, the immature timber exemption, and the yield plan—are described and analyzed as to suitability for equitably meeting the forest situation and as to their effects on public revenues.

The tariff on sugar, L. S. ELLIS (*Freeport, Ill.: Rawleigh Found.*, 1933, pp. 190, figs. 12).—"The object of this monograph is to determine the effectiveness of the tariff on sugar in increasing the price of sugar in the United States, and to measure the costs or benefits to the various groups of consumers and producers in this country." Chapters are included on the world sugar situation, sugar and the United States tariff policy, the sugar industry of continental United States, the sugar market, the effect of the sugar duty on prices, and the costs and benefits of the sugar duty. An introductory note by J. R. Commons, B. H. Hibbard, and W. A. Morton, a discussion of methods of tariff investigation by Morton, a description of the Chadbourne plan submitted to the Cuban planters and the Cuban Government for the stabilization of the sugar industry and the raising of sugar prices, and a discussion of the distribution of sugar among various classes of consumers are also included.

International yearbook of agricultural legislation, 1931 [trans. title] (*Inst. Internatl. Agr. [Roma], Ann. Internatl. Lég. Agr.*, 21 (1931), pp. LXXXIX+1165).—This volume continues the series previously noted (E.S.R., 67, p. 472).

History of agriculture in the southern United States to 1860, L. C. GRAY and E. K. THOMPSON (*Carnegie Inst. Wash. Pub.* 430 (1933), vols. 1-2, pp. XIX+IX+1086, figs. 12).—The several parts of this history, which is a companion study to that for the northern United States (E.S.R., 54, p. 83), deal with agricultural beginnings and geographic expansion, agricultural industries

in the colonial period, institutional development in the colonial period, economic evolution in the South, the development of national economy, agricultural industries and husbandry in the post colonial period, and geographic expansion and regional development. Its organization is described by the author as follows:

"Except for certain chapters dealing with broad tendencies which manifested themselves throughout the ante bellum period, it will be found that there are three primary chronological subdivisions—the colonial period; a period of transition from colonial to national economy, extending from the close of the Revolutionary War to about the time of Whitney's invention of the cotton gin; and the remaining period up to the Civil War. Each of these chronological divisions is subdivided topically, and each topic is usually considered chronologically and to some extent geographically. Inasmuch as the topical treatment fails to provide a synthetic picture of agricultural development in the various important regions, at the risk of a seeming lack of unity I have introduced certain chapters sketching in broad strokes the course of agricultural expansion by regions. For the purpose of avoiding unnecessary repetition of details, already treated by topics, I have made extensive use of cross references, and while the regional chapters give the broader lines of development and the distinctive characteristics by regions, a more complete regional picture can be gained only by supplementary reference to the topical chapters."

An extensive bibliography (pp. 945–1016) and statistical tables and notes (pp. 1019–1043) are included.

The introductory note is by H. C. Taylor.

The farm and the nation, E. J. RUSSELL (*London: George Allen & Unwin, 1933, pp. 240, figs. 9*).—The factors involved in developing the agriculture of the British Empire "for the purpose of preserving it and using it for increasing the national wealth and opening up work on the land for some of the growing army of unemployed" are discussed in chapters on *The Nation's Food: From Whence Does It Come? The Ups and Downs of British Farming; Our Farming Land; How We Now Use It; The Result of Our Agricultural Efforts; The Empire as a Source of Food; The Empire's Contribution to Our Food Supply: Could It Be Increased? Some of the Farmer's Difficulties; How Can We Use Our Land to Better Purpose? and Can the Country Districts Absorb the Displaced Men?*

[**Proceedings of the Council of Agriculture for England**] (*Jour. Min. Agr. [Gt. Brit.], 39 (1933), No. 10, pp. 930–951*).—Included are the reports of the standing committees on the subjects of the interim and final reports of the Central Landowners' Association on agricultural policy and of the purity of the milk supply, on the report of the Reorganization Commission for Pigs and Pig Products, and on the subject of the Dutch auction system, together with the discussions on these reports and other subjects.

Imperial Economic Conference, 1932: Report of the Conference (*Ottawa: Govt., 1932, pp. 159; Sup. vol., pp. 82*).—These two volumes include the report of the Conference held at Ottawa, July 21 to August 20, 1932.

The first volume includes a list of the personnel; the reports of the committees and the subcommittees on the promotion of trade within the Commonwealth, customs administration, commercial relations with foreign countries, monetary and financial questions, and methods of economic cooperation, and the Conference conclusions on each subject, together with the concluding resolutions of the Conference and the statements of the several delegates. The second or supplementary volume includes the texts of the trade agreements

concluded during the Conference between the United Kingdom and Australia, Union of South Africa, New Zealand, India, Newfoundland, Southern Rhodesia, and Canada; between Canada and Irish Free State, Union of South Africa, and Southern Rhodesia; and between the Union of South Africa and Irish Free State.

Imperial Economic Conference at Ottawa, 1932: Summary of proceedings and copies of trade agreements [and appendices] (*London: Govt., 1932, pp. 95: App., pp. 205*).—The first volume summarizes the conclusions in the report noted above and includes the texts of the agreements between the United Kingdom and the several dominions. The second volume presents the same information as given in volume 1 noted above.

Ottawa Conference Number (*Farming in So. Africa, 8 (1933), No. 83, pp. 39-90, figs. 18*).—Included is an article entitled *The Ottawa Conference and Our Agricultural Export Trade*, by P. R. Viljoen (pp. 39-48), discussing the Imperial Economic Conference and the agricultural export trade of the Union of South Africa, including farming conditions in overseas countries, the Union's overseas markets and trade with the United Kingdom and Canada, British preferences, and the Empire trade and the Conference. Other articles on the Union's agricultural exports and departmental organization and work are also included as follows: *Our Livestock and Meat Industry*, by C. H. Neveling and D. J. Schutte (pp. 49-51, 88); *The Dairy Industry in the Union*, by E. G. Hardy (pp. 52-55); *Export of Fish and Fish Products from the Union of South Africa* (pp. 56, 82); *The South African Export Poultry Industry*, by J. J. Jordaan, A. J. Beyleveld, and C. H. Spamer (pp. 57, 58, 62); *The Mohair Industry*, by F. J. du Toit and H. M. Stoker (pp. 59, 62); *The Wool Industry in South Africa*, by G. J. Schuurman, H. M. Stoker, and A. F. du Plessis (pp. 60-62); *The Union's Hide and Skin Industry*, by C. H. Neveling (pp. 63, 64); *The South African Export Fruit Industry*, by F. G. Anderssen, A. J. Beyleveld, et al. (pp. 65-76, 82); *The Future of Our Maize Industry*, by S. J. de Swardt and M. G. Stahl (pp. 77-79); *Production and Utilization of South African Peanuts*, by F. M. du Toit (pp. 80-82); *Development of the Wattle Bark Industry in South Africa*; *Marketing Prospects for the Future*, by W. E. Watt and A. J. Beyleveld (pp. 83, 84, 86); *Tobacco Production in the Union*, by P. Koch and W. J. Pretorius (pp. 85, 86); *Development of a Meat Export Trade*, by P. R. Viljoen (pp. 87, 88); and *Quality Requirements in the Export of Beef*, by D. J. Schutte (pp. 89, 90).

Diminishing returns in view of progress in agricultural production, T. W. SCHULTZ (*Jour. Farm Econ., 14 (1932), No. 4, pp. 640-649*).—This contribution from the Iowa Experiment Station presents the results of a study of the Iowa crop production 1880-1930, comments upon certain aspects of the phenomenon of diminishing returns, and discusses whether the experience of agriculture tends to invalidate Marshall's interpretation of the law of diminishing returns.

Voluntary allotment: Planned production in American agriculture, E. S. MEAD and B. OSTROLENK (*Philadelphia: Univ. Penn. Press; London: Humphrey Milford, Oxford Univ. Press, 1933, pp. V+147*).—"We propose now to tell the sequel to the story told in Harvey Baum [E.S.R., 60, p. 585], to describe in some detail the agricultural crash in which the agricultural depression has culminated; to outline the pattern of the rural life of the future, provided events are allowed to work themselves out without control, remedy, or effective farm revolt; and finally to discuss the plan to use the arm of the Federal Government to stabilize agriculture, the largest American industry, a plan which may furnish a pattern for the realization of planned production." The

several chapter headings are: Ole Swanson—a typical American farmer, the farmer in 1932, the profitless decade in American agriculture, increasing production and decreasing demand, the operation of “natural economic law” in American agriculture, stabilization by farm attrition versus controlled production, the repeal of the law of supply and demand, the voluntary allotment plan, how the plan will work, and farm relief the way out of the depression.

Local land-utilization studies in relation to problems of rural economic organization, C. F. CLAYTON (*Jour. Farm Econ.*, 14 (1932), No. 4, pp. 662–678).—“The special object of this paper is to consider the scope and purpose of the type of local land-utilization study which has as its central problem the determination of an appropriate pattern of rural economic organization for an established and organized local population group.” The several premises and points of view from which studies of rural economic organization have been or may be undertaken, the nature of the findings of such studies, and the place of land-utilization studies in the studies of rural economic organization are discussed.

Four hundred million acres: The public lands and resources, C. E. WINTER (*Casper, Wyo.: Overland Pub. Co.*, 1932, pp. 352, pls. 16, figs. 4).—This volume presents information regarding public lands in the United States, past and present United States land policies, and proposed future policies. “As a whole it supports the cession of all the remaining lands and their resources, excepting the national parks, by the Federal Government to the States in which they are situated.”

The influence of type of production and size of farm on Illinois farm expenses, 1926–1928, R. C. ROSS (*Abs. Thesis, Univ. Ill., Urbana*, 1931, pp. [19]).—This is an abstract of a doctorate thesis. The study was based on records kept by the operators of 475 Illinois farms for the period 1926–28 as part of the extension work of the university. Its purpose was “to determine for farms of various sizes and for different types of production (1) the amounts and kinds of cash expense incurred in carrying on the business; (2) the nature and amounts of expense other than cash outlays; (3) the investment of new capital in the business, and the extent to which such expenditures maintained or increased the value of the productive plant; and (4) the relationships of expenses and capital expenditures to the size and nature of the farming business, as a basis for setting up working standards for budgeting purposes.”

Proceedings of the New Jersey Land Use Conference (*New Jersey Stat. Bul.* 552 (1933), pp. 78, figs. 2).—Included are a list of the sponsoring committees and the following papers presented at the conference held at New Brunswick, N.J., December 21, 1932: Address of Welcome, by R. C. Clothier (pp. 9, 10); The Purpose and Scope of the Land Use Conference, by J. G. Lipman (pp. 10–13); Land Use Policies and Programs in the United States, by A. R. Mann (pp. 13–22); Aspects of a State Program of Land Utilization, by L. C. Gray (pp. 22–30); Land Use and Soil Erosion, by H. H. Bennett (pp. 31–47); The Land Resources of New Jersey, by L. L. Lee (pp. 47–57); Land Use in New Jersey, by J. K. Powell (pp. 57, 58); Can the Utilization of Idle Land Be Made a Factor in the Reduction of Delinquency? by C. Derrick (pp. 58–64); Financing Home Ownership, by F. G. Stickel, Jr. (pp. 64–72); and Forestry and Parks in Relation to Land Use, by C. P. Wilber (pp. 72–76).

Cost of irrigation water in California, H. F. BLANEY and M. R. HUBERTY (*Calif. Dept. Pub. Works, Div. Water Resources Bul.* 36 (1930), pp. 146, figs. 14).—This is a revision, extension, and enlargement of the report previously noted (*E.S.R.*, 53, p. 587) and presents the results of a study covering several years, the data for 1929 being given in the greatest detail. The variations

in annual cost of irrigation water in 1929 under public utilities, mutual water companies, and irrigation districts are summarized in groups comprising various crops and systems furnishing gravity water only and pumped water only in tables showing among other things the acreage of different crops irrigated, factors in annual cost of water, and the annual cost of water. A chapter discusses the general factors entering into the cost of pumping. An appendix includes similar tables for 1922 reprinted from the earlier bulletin.

Permissible annual charges for irrigation water in upper San Joaquin Valley, F. ADAMS and M. R. HUBERTY (*Calif. Dept. Pub. Works, Div. Water Resources Bul. 34* (1930), pp. 89, figs. 7).—The results are presented of an investigation made in cooperation with the College of Agriculture of the University of California to determine how much the landowners of the area can afford to pay for irrigation water brought into the area under the proposed State plan of water conservation. "The detailed procedure followed in the investigation has been (1) to ascertain the costs of producing and harvesting the principal crops grown in the upper San Joaquin Valley, without including interest on the average investment or a charge for irrigation water; (2) to estimate the farm income on the basis of probable yields and prices; (3) to compute interest on the average investment at 6 percent per annum; and (4) from the foregoing to ascertain the margin remaining, after covering the costs of producing and harvesting the crop, together with interest at 6 percent per annum. It has been assumed that this amount will be available for payments for irrigation water and additional profits over interest." Complete data with charts "from which the amount available above the costs of producing and harvesting the crop and interest at 6 percent can be readily computed" are given for oranges, deciduous fruits, grapes, and cotton. Less complete data are given for alfalfa, grain, and miscellaneous crops.

The report of a study by C. V. Givan and J. E. Christiansen of the cost of water to irrigators in the upper San Joaquin Valley (pp. 61-89) includes an analysis of data regarding the costs of gravity and pumped water, costs for different crops, and costs under different types of organizations.

The world wheat situation, 1931-32: A review of the crop year, M. K. BENNETT ET AL. (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 9* (1932), No. 3, pp. [1]+63-136, figs. 28).—This is a continuation of the series previously noted (E.S.R., 67, p. 182). The year 1931 ended with another large crop in prospect, the fourth in succession and the third of severe economic recession. World wheat prices in gold fluctuated on the lowest level in modern times.

Low prices stimulated the food use of wheat in China and feed use in North America and a few free-trade European countries. Larger fractions of North American surpluses were retained domestically than ever before. World stocks were reduced only about 40,000,000 bu. during the year, and at the close were more than 50 percent above normal. United States wheat made up nearly 45 percent of the world carry-over, a record proportion.

Other subjects discussed are governmental operations and regulations, wheat prices, and international trade and consumption. Some 36 tables are carried in the appendix.

Survey of the wheat situation, April to July 1932 and August to November 1932, M. K. BENNETT, H. C. FARNSWORTH, ET AL. (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 8* (1932), No. 10, pp. [1]+469-502, figs. 6; 9 (1933), No. 4, pp. [1]+137-166, figs. 6).—These studies are a continuation of the series previously noted (E.S.R., 68, p. 113).

In the April-July 1932 period international shipments of wheat dropped from a peak in May to very low levels in July. General pessimism and favor-

able crop news preceded a sharp drop in wheat prices in early June. By July prices had recovered somewhat but remained distinctly low. The crop year 1932-33 was viewed as one of burdensome wheat surplus. Price movements would be influenced by pressure of exports from other producing countries and the course of business.

In the August-November 1932 period, reported in No. 4, international trade in wheat was the smallest in a decade. Despite heavy supplies, United States exports were the smallest in years. International wheat prices declined in the September-November period, and new record low prices were registered in all future markets in November-December, though Chicago prices remained above export parity.

The wheat outlook, as viewed in mid-December, is also discussed. Statistical tables are included in appendixes to the two numbers.

Estimation of end-year world wheat stocks from 1922, M. K. BENNETT (*Wheat Studies, Food Res. Inst. [Stanford Univ.]*, 9 (1933), No. 5, pp. [1]+167-186).—"The purposes of this study are to present estimates of 'world' wheat stocks ex-Russia at the end of each of the 11 crop years beginning with 1921-22, including estimates for as many positions and countries as the data justify; and to describe the methods of estimation."

Price relations between July and September wheat futures at Chicago since 1885, H. WORKING (*Wheat Studies, Food Res. Inst. [Stanford Univ.]*, 9 (1933), No. 6, pp. [1]+187-238, figs. 9).—Some conclusions drawn concerning these relations are as follows:

"Given an accurate appraisal of the domestic supply position, the price spread in June may usually be predicted with great accuracy. Substantial disparity between the actual spread in June and that to be expected from the supply statistics has occurred in eight years since 1896. . . . Existence of such a disparity gives prima facie evidence of abnormal speculative market conditions. Changes in the spread tend to occur in response to influences specifically related to the spread, and not in response to general price influences. . . . The July-September price spread is subject to conspicuous and reliably predictable seasonal changes."

Price statistics for the years studied are included in the appendix.

Trends in the apple industry, C. C. HAMPSON (*Washington Col. Sta. Bul.* 277 (1933), pp. 108, figs. 32).—This study was made "to determine the prospects in the apple industry, considering quantity of production, recent plantings and market possibilities, and particularly to estimate the future situation of apple growers of Washington." Tables and charts are included and discussed showing the annual changes and trends of export prices of apples, 1789-1930, of prices of apples in the United States, 1910-30, of Baldwin apples in Boston, 1889-1930, and prices to Wenatchee-Okanogan growers, 1912-30; apple production, total 1889-1931 and commercial 1916-31, and car-lot shipments, 1916-31, in the United States, the box States, and the barrel States; the number of trees, bearing and nonbearing, 1910, 1920, 1925, and 1930; the percentage of trees, total and by varieties, in four age groups in 1928, and the average yield per tree during different periods, 1907 to 1931, in the United States, the box States, and the barrel States; and the trends in production, 1909-31, of different competing fruits. Similar data are analyzed in detail for Washington and the several districts and subdistricts of the State.

From 1911-15 to 1927-31 total production changed as follows: Box States increased 34,000,000 bu., barrel States decreased 88,000,000 bu., and Washington increased 24,779,000 bu. The average commercial production from 1916-20 to 1927-31 changed as follows: Box States increased 16,702,000 bu., barrel

States decreased 1,807,000 bu., and Washington increased 11,132,000 bu. Average car-lot shipments, 1916-20 to 1926-30, increased 25,490 in the box States, 10,127 in the barrel States, and 18,006 in Washington. The average yield per tree, 1907-11 to 1927-31, increased from 1.25 to 4.21 bu. in the box States, from 1 to 1.41 bu. in the barrel States, and from 1.3 to 6.1 bu. in Washington. The number of bearing trees in the period 1920-30 decreased 7,836,000 in the box States, 18,630,000 in the barrel States, and 2,770,000 in Washington. The number of nonbearing trees from 1920 to 1930 decreased 1,048,000 in the box States and 7,696,000 in the barrel States and increased 192,000 in Washington.

During the period 1927-31 Washington produced about 19 percent of the total production, 28.5 percent of the commercial crop, and 32.8 percent of the car-lot shipments of apples in the United States. About 86 percent of the State's total crop was marketed as fresh fruit, as compared with 59 percent in all other States. The number of bearing trees in 1930 was 73 percent more than in 1910, but approximately 2,800,000, or 35 percent, less than in 1920. During the next 5 years in Washington more trees will reach the commercial bearing age annually than during recent years, but the increase in yield will be retarded by the fact that approximately three fourths of the trees have either completed or will soon complete their early bearing period.

As to the next few years, the number of plantings, age of trees, etc., indicate that the production of Winesap apples in Washington will increase less rapidly than heretofore and that later production may fail to increase; that the production of Delicious apples will probably continue to increase at about the same rate as heretofore, but that at least part of the premium paid for this variety will disappear due to both the quality and the quantity produced in the barrel States; that the production of Jonathans will become relatively less important due to the decrease in the number of trees in Washington and the material increase in production in the barrel States; that the production of Rome Beauty apples will not increase rapidly in Washington, but there will be a heavier production in the barrel States; and that there will be no appreciable increase in the production of Yellow Newtown apples in Washington.

The present trends indicate shifts in Washington production from lower-priced varieties to the Delicious variety, and a shift in production from the lower Yakima Valley to the upper Yakima Valley.

Economic studies of dairy farming in New York.—X, 141 farms in the Tully-Homer area, crop year 1926, E. G. MISNER (*New York Cornell Sta. Bul.* 551 (1933), pp. 105, figs. 36).—Data for the year ended February 28, 1927, were gathered by the survey method in part of the area studied for 1921 (E.S.R., 52, p. 589). The types of farming in the area, climate, soils and topography, transportation facilities, markets, etc., are described. The data regarding farm capital, receipts from crops, livestock, livestock products, and other sources, expenses and labor income are analyzed and discussed. The price premiums for milk and the successful farms are described and discussed, and some comparisons are made between the same farms in 1921 and 1926.

Size of business was one of the most important factors affecting labor income. Productive-man-work units, number of cows, acres in crops, and man equivalent were the best measures of this factor. On dairy farms, tons of milk per man was the most important measure of efficiency, about 45 tons being needed on grade A milk farms to realize a \$2,500 labor income. Farms with less than 30 tons per man averaged very low labor incomes. Productive-man-work units accomplished per man was a good measure of the efficiency of labor, at least 250 work units per man being necessary for a high income.

Crop acres per man and animal units per man did not show as high a relationship. Rates of turn-over of capital ranked next below efficiency in man labor as a factor affecting labor income.

Farms producing less than 6,000 lb. of milk per cow showed lower labor incomes, while those with 7,000 lb. or more had an income of \$1,973. Farms with a crop index for feed crops of 160 percent or more of the State average made high labor incomes. The crop index of potatoes, cabbage, peas, and other cash crops did not bear so close a relationship to income.

Although the leading enterprise of the section is market milk, the success of the farm business depends to a large extent on combining other enterprises with dairying. Intensively stocked farms were more profitable than those with a large area per animal unit. The farms with a small percentage of the cattle units in heifers were the more profitable.

The average labor income on the farms selling grade A milk was \$1,216, and that on grade B farms \$429. Of the average receipts, 67 percent was from milk sold, 10 percent each from livestock and crops sold, 8 percent from increase in inventory, and 5 percent from miscellaneous sources. Of the current expenses, 27.4 percent was for labor other than that of the operator, 33.5 percent for feeds, 6.1 percent for taxes, 7.1 percent for machinery, including purchases and repairs, and the balance for miscellaneous items.

Part-time farming: A brief list of recent references, compiled by E. M. COLVIN (*U.S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog.* 43 (1933), pp. 20+[3]).—Included are 56 annotated citations from pamphlets, periodical articles, congressional hearings, and editorials.

Agricultural marketing, B. N. BHARGAVA (*Univ. Lucknow, Studies Econ. and Sociol.* No. 5 (1930), pp. [2]+XIII+109).—The marketing of grain in the rural areas of India is discussed in chapters on the cultivator as a trader, the chain of middlemen, speculation, storage, periodical markets, transport, and some main defects and suggestions.

Roadside marketing of agricultural products by Ohio farmers, C. W. HAUCK and H. M. HERSCHLER (*Ohio Sta. Bul.* 521 (1933), pp. 37, figs. 5).—This bulletin is based on data obtained regarding markets operated in 1931 and 1932. In analyzing the data the markets were grouped into four classes on the basis chiefly of permanency of buildings, and into three classes on the basis of type of road on which located. The number and types of markets and their location as regards type of road and distance from the nearest municipality, the products sold, volume of sales, overhead and operating costs, period of operation, prices charged, and patronage are discussed. Included also is a study of the sources of food supply of 198 wealthy, 1,146 medium income, and 400 poor Columbus families, and the purchases at roadside markets by Columbus families. The possibilities of cooperative roadside marketing are discussed.

The home market for North Carolina cotton, J. G. KNAPP (*North Carolina Sta. Bul.* 284 (1933), pp. 58, figs. 11).—This bulletin is based chiefly on the reports of the Federal Departments of Agriculture and Commerce dealing with cotton production, consumption, and grade and staple estimates, and reports on mill requirements secured from 115 North Carolina mills for the years 1927–29, 121 mills for 1930, and 94 mills for 1931.

Tables and charts are included and discussed showing the consumption of cotton, by years 1919–20 to 1930–31, inclusive, in the 5 leading cotton-manufacturing States, and the percentage distribution, by staple lengths, 1928–29 to 1931–32; and the sources of supply and the percentage distribution of cotton used by North Carolina mills, by staple lengths, 1926–27 to 1930–31, and by grades, 1929–30 and 1930–31. Other charts and tables show the relations between the

amounts of cotton of different staple lengths and grades produced and consumed in the State and in each of the 4 geographic regions, and the sources of out-of-State cotton consumed in each region. The importance of quality of cotton in yarn manufacture, the suggestions of mills as to how the cotton producers of the State can best serve the mill needs, and the accomplishments in the State in improving grade and staple lengths are discussed.

Appendixes include discussions of the method used in estimating consumption by grade and staple length; the changes in staple length consumption by 41 mills from 1926-27 to 1930-31; the distribution of consumption, 1927-31, of different staple lengths; the changes, 1910-11 to 1930-31, in the production, consumption and exportation of cotton; and the percentage distribution of North Carolina cotton production, 1928-29 to 1931-32, by staple length, grade, color, and tenderability.

The annual averages for 1927-31 were North Carolina production, 912,660 bales; North Carolina consumption, 1,505,575 bales; and North Carolina consumption of North Carolina cotton, 498,096 bales. The out-of-State movement of North Carolina cotton, although rapidly diminishing, can be accounted for largely by the shortness of staple length. No North Carolina cotton is moving out of the State because of lowness of grade, as more cotton of the lower grades is consumed than is normally produced. Physical separation of the producing and consuming areas of the State and the quality of cotton produced and consumed in the different areas are important factors affecting the consumption of North Carolina cotton in the State. The mills of the State suggest that the producers of the State can best meet the needs by increasing staple length, by developing greater uniformity of staple and grade, and by improving grade through better handling practices.

Financial operations of Ohio farmer owned elevators during the fiscal year 1931-32, B. A. WALLACE (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 50 (1932), pp. 17, fig. 1*).—This is a continuation of the study previously noted (*E.S.R.*, 66, p. 585). It is based on the analysis of the principal balance sheet and income and expense items of 147 companies operating 178 plants, detailed analysis of expense items, commodity sales, and margins of 45 companies, and the accounts receivable of 17 companies for the period January 1928 to December 1931. Comparisons are made with the three preceding years.

The burden of increased costs of distribution, G. SHEPHERD (*Jour. Farm Econ.*, 14 (1932), No. 4, pp. 650-661, figs. 3).—Using Iowa as the source of supply and New York City as the source of demand and assuming a \$1 per 100 lb. increase in shipping charges, analysis is made of the effects on supply, demand, and farm and consumer prices of hogs considering (1) the slope of the demand and supply curves and (2) the ease with which these curves shift as a whole.

In summing up his findings, the author states that "the effects of a general increase in distributive costs, or of a business depression, or of a falling general price level are similar. They all cause a downward shift in the demand schedule for agricultural products. The demand curve cuts the supply curve at a lower point. But instead of production decreasing and the burden of the change being divided between producer and consumer, the producer, having already made his commitments in his plant as a going concern, continues to produce as large quantities as before, though at a lower price level; the supply curve shifts downward and the producer bears the whole burden himself. . . .

"The total demand for agricultural products is increasing at a very much slower pace now than before the war. Probably by the time another 10 or 20 years have elapsed it will have ceased to increase at all. Agriculture is losing a large part of its powers of recuperation. The burden of increased costs of

distribution (mostly the result of higher freight rates and higher labor wage scales) or of a business depression, or of a falling general price level, falls chiefly on the producer now the same as it did before the war. But whereas a generation or two ago the steady increase in the demand for agricultural products helped him to roll the burden off with the passage of time, nowadays the load settles on his shoulders more permanently; he must struggle with it unaided until such time as the property is passed on to a new owner on a new value basis."

Competition in the American tobacco industry, 1911-1932, R. Cox (*Thesis, Columbia Univ., New York, 1933, pp. 373, pls. 4*).—This is "a study of the effects of the partition of the American Tobacco Company by the United States Supreme Court."² The several chapters analyze and discuss the partition of the company, the growth of the tobacco industry since the partition, evidences of competition in the distribution of business among manufacturers, competitive influences affecting the scale of production, competitive influences affecting integration, competition in the purchase of leaf tobacco, evidences of collusion in leaf purchases, price competition among manufacturers in the sale of tobacco products, nonprice competition among manufacturers in the sale of tobacco products, competition among distributors of tobacco products, effects of competition on the successor company earnings, and financial control of the successor companies. The final chapter contains the conclusions of the author. A description and discussion of the United Cigar Stores Company (pp. 325-360) is also included.

The wholesale poultry business in San Francisco, E. T. GREYER (*Jour. Farm Econ., 14 (1932), No. 4, pp. 630-639*).—The organization and trends in the business from 1900 to 1930 are described. The changes brought about by the formation of a holding and operating company in 1928, and the formation of two farmers' cooperative companies, one in 1926 and the other in 1929, are discussed.

Report of the reorganisation commission for milk, E. GRIGG ET AL. ([*Gt. Brit.*] *Min. Agr. and Fisheries, Econ. Ser. 38 (1933), pp. 228*).—This is the report of the commission appointed in April 1932 under the Agricultural Marketing Act, 1931, to prepare "a scheme or schemes (applicable in England and Wales) for regulating the marketing of milk." The several chapters cover milk marketing in England and Wales since 1922, production and the position of the producer, distribution and the position of the distributor, consumption and the interests of the consumer, manufacture and imports, the law as it affects milk, costs and profits of distribution, objects and the structure of reorganization, grades and quality, price policy—schemes considered, price policy for milk for liquid consumption, price policy for manufacturing milk, distribution of powers, development of manufacture and recommendations regarding duties on imported milk products, and cooperation with Scotland and Northern Ireland. Other chapters summarize the main conclusions and recommendations and the concluding observations of the commission.

The United States export and import trade in dairy products, K. H. McDONEL (*Michigan Sta. Tech. Bul. 131 (1933), pp. 37, figs. 6*).—This bulletin, which gives special consideration to the tariff on dairy products, includes and discusses tables and charts showing the production of dairy products, 1925-28, of the principal exporting and importing countries; the exports and imports of the United States of fresh milk and cream, by 5-year periods 1891-1920, and by years 1921-30, and of condensed, evaporated, and powdered milk, by years 1910-31; the destination of United States exports of condensed and

² 221 U.S. 106; also as U.S. Senate, 62. Cong., 1. Sess., Doc. 40 (1911).

evaporated milk, 1926-29; the exports and imports of the United States of cheese and butter, by 5-year periods 1871-1920, and by years 1921-31; the destination of such exports, 1926-29; the United States imports for consumption, by years 1910-31, of cream, fresh milk, cheese and cheese substitutes, butter, and casein; and comparisons of the costs of production in the United States and the costs of production, including transportation to border plants, normal principal markets, or New York City, of fluid milk and cream in Canada, cheese in Switzerland, butter in Denmark, and casein in Argentina. Tables give the rates of duty on dairy products under different United States tariff acts, 1789 to 1930. The effects of the different acts on imports are discussed.

The overseas trade of the United Kingdom, 1924-31, H. W. MACROSTY (*Jour. Roy. Statis. Soc., n. ser., 95 (1932), No. 4, pp. 607-657*).—This is a paper read before the Royal Statistical Society, May 24, 1932, with discussions thereon. It surveys the British overseas trade as a whole and in its chief categories of food, drink, and tobacco, raw materials, and manufactured goods; examines chief groups of commodities within the main classes, with special reference to the state of the export trade in 1929 and 1931; and gives some notes on the chief groups of commodities with a view to indicating the main characteristics of each trade.

Crops and Markets, [April 1933] (*U.S. Dept. Agr., Crops and Markets, 10 (1933), No. 4, pp. 113-152, figs. 3*).—Included, besides reports, summaries, tables, charts, etc., of the usual types, are brief discussions of the changes in farm population during 1932 and of the farm products price situation and an article on income from farm production in the United States, 1932, analyzing the income as a whole and the gross and cash incomes, by States, and making comparisons with other years, principally 1924-31 and 1929-31.

International yearbook of agricultural statistics, 1931-32 (*Internatl. Inst. Agr. [Roma], Internatl. Yearbook Agr. Statis., 1931-32, pp. XXXIX+782*).—This is a continuation of the series previously noted (*E.S.R., 66, p. 885*). The following changes have been made from earlier volumes: (1) The period used as the basis of comparison has been changed from the average 1909-13, or in certain cases 1913 to the average for the quinquennium, or in some cases the year, immediately preceding the series; (2) the tables on prices have been enlarged by the addition of quotations for a number of products and markets; (3) comparative tables have been added giving for all products and markets concerned the equivalents in gold francs per quintal of the original quotations; (4) tables of stocks and further tables relative to the distribution of agricultural holdings according to size and mode of tenure have been added; (5) tables relating to chemical fertilizers have been revised; and (6) the forest statistics have been omitted and are to be published in a separate series.

RURAL SOCIOLOGY

Population trends in the United States, W. S. THOMPSON and P. K. WHELPTON (*New York and London: McGraw-Hill Book Co., 1933, pp. X+415, figs. 36*).—This is "one of a series of monographs published under the direction of the President's Research Committee on Social Trends, embodying scientific information assembled for the use of the Committee in the preparation of its report entitled *Recent Social Trends in the United States*." The several chapters deal with the growth of population in the United States, the distribution of the population, the national origins of the white population, the age composition of the population, sex composition, marital condition, deaths and death rates, births and birth rates, population growth from immigration and natural increase, probable trends and consequences of future growth, and population policy.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Effectiveness of vocational education in agriculture, F. W. LATHROP (*Fed. Bd. Vocat. Ed. Bul. 82, rev. (1933), pp. VII+19, figs. 8*).—This study of the value of vocational instruction in agriculture in secondary schools as indicated by the occupational distribution of former students is a revision of the bulletin previously noted (*E.S.R.*, 60, p. 890). The occupations of the 1917-22 and the 1922-27 groups have been rechecked after another 5-year period, and analysis is made of a random selection of 6,279 students in 47 States who left school in the period 1927-32. Charts are included and discussed showing the occupational and farming tenure distribution of each group at the end of each 5-year period, 1917-32. Other tables and charts show the percentage of students leaving school each year, 1920-31, who are now farming, the relation of effect of length of course of training to percentage of students farming, the average number of years of vocational training received by the students reporting for each period, and the percentage of such students who were high school graduates.

Some of the findings were as follows: The percentage of vocational agriculture students going into farming has increased and that entering colleges has decreased. There has been practically no change in the percentage of students with recent training who have taken over entire responsibility for operating farms, but there has been some increase in the percentage of renters. The number of students farming has tended to decrease, due largely to partners and laborers shifting into nonagricultural occupations. The number of owners in both the 1917-22 and the 1927-32 groups had practically doubled by 1932, and there had been a general movement upward in the farming occupation scale on the part of former students. The percentage of students farming was higher for recent than for earlier graduates. Students with two or more years of vocational training are more likely to remain on the farm than those with only one year of training. Recent students on an average have received a somewhat longer training than earlier students, and a larger percentage of them are high school graduates.

The meaning of the findings to State and local programs of vocational education in agriculture is discussed.

A statistical survey of home economics in the public schools of the United States, 1931-1932 (*New York: Metrop. Life Ins. Co., [1932], pp. 24*).—The data, which cover 80,644 elementary and high schools with an enrollment of 5,475,772 girls, were obtained through questionnaires returned by county and city superintendents of schools. In general, the tables included show for city and county high and elementary schools, by States, city high and elementary schools, by size of city, and city and county elementary schools, by grades, the number of schools reporting, number offering home economics courses, total enrollment of girls, and the number of girls enrolled in home economics courses.

Readings in marketing, F. E. CLARK (*New York: Macmillan Co., 1933, rev. ed., pp. XX+798, pls. 2, figs. 32*).—This is a revised edition of the text previously noted (*E.S.R.*, 53, p. 694). The readings are grouped under the following headings: Introduction, marketing functions, marketing farm products, wholesaling farm products, middlemen of the agricultural wholesale market, marketing raw materials, marketing manufactured products, wholesale middlemen of the manufacturers' market, direct marketing of manufactured products, retail distribution, large-scale retail establishments, recent developments in retailing, cooperative marketing, physical supply, market finance, market risk, market news, standardization, competition and prices, market price, price maintenance and unfair competition, the relation of the State to marketing, the cost of marketing, and final criticism.

FOODS—HUMAN NUTRITION

Report of the committee on testing soft wheat flours, M. M. BROOKE (*Cereal Chem.*, 9 (1932), No. 4, pp. 406-428).—This annual report (E.S.R., 66, p. 686), consists chiefly of the following subcommittee reports:

Report of subcommittee on cake-baking method for testing soft wheat flours, L. H. Bailey (pp. 407, 408).—A white cake formula and method of procedure are submitted for adoption as a tentative method for testing soft wheat flours.

Report of the subcommittee on cake score-card, R. A. Barackman (pp. 409, 410).—No changes have been made in the values assigned in the 1931 score card, but it is recommended that "fat tolerance, sugar tolerance, and water tolerance be designated in reports in terms of minimum and maximum percentage (flour basis) which will not impair cake quality; that reports also include a statement of moisture, protein, and ash (calculated to 15 percent moisture basis), and H-ion concentration in terms of pH; that viscosity values be added to reports dependent on the findings of the viscosity committee; that final judgment of a cake flour be based on moisture, protein, ash, pH, tolerance figures, viscosity values, and score, with comments regarding faults."

Reports of the subcommittee on pie-flour tests, C. B. Kress (pp. 411-413).—This report discusses qualities to be considered in evaluating pie crust, including color, tenderness, flakiness, form, and dryness. A pie crust formula and method of procedure are described, and tables are given of physical and chemical tests of five types of flour and the grading of pie crust made from them. A mechanical sifting test indicating the quality of the crust by the amounts which can be made to pass through a no. 10 sieve is proposed.

Report of the subcommittee on tests for biscuit and self-rising flours, L. D. Whiting (pp. 414-419).—A tentative formula and procedure for baking biscuits are given, with results of collaborative tests for plain and self-rising biscuit flours. The results are also given of collaborative tests on the CO₂ content of self-rising flours as determined gasometrically.

Report of the subcommittee on testing of soft wheat flours for use in cookies, P. Brown (pp. 420-423).—This report includes a classification of machine made cookies, a formula and mixing procedure for making cookies in testing soft wheat flours, and the reports of studies of the effect of flour grade and of bleaching on the quality of cookies baked by the standard method.

Report of the subcommittee on hydrogen-ion concentration with special reference to the effect of flour bleach, E. E. Smith (pp. 424-428).—This report describes a preliminary study of the effect of chlorine bleach on certain soft wheat flours, as revealed by cake baking tests using bleached and unbleached flour from various flour streams. In general chlorine bleaching increased the score of cakes in almost every respect.

Testing the quality of flour by the recording dough mixer, C. O. SWANSON and E. B. WORKING (*Cereal Chem.*, 10 (1933), No. 1, pp. 1-29, figs. 22).—This paper describes the construction, operation, and application to flour testing of a recording dough mixer which is a modification of one described previously (E.S.R., 55, p. 692).

Variation in the weight of a given volume of different flours, I-III, E. GREWE (*Cereal Chem.*, 9 (1932), Nos. 3, pp. 311-316; 5, pp. 531-534; 6 pp. 628-636, figs. 2).—Three papers are presented.

I. Normal variations.—As the result of an extensive series of measurements by the author and several collaborators of the weights of a cupful of sifted flour from hard and soft wheat milled in different sections of the country, the average weights per level cup of flour made from hard winter wheat and hard spring wheat were found to range from 111 to 114 g. This corresponds

closely to the 113 g reported by Woodruff (E.S.R., 48, p. 159) as the average weight of a cupful of hard wheat flour. Greater differences were found in the weights of soft wheat flour from different localities. The average weight of soft wheat flours milled in Missouri, Illinois, Indiana, and Ohio was 93 g per cup, and of samples from mills in the Pacific Northwest, Michigan, and the eastern part of the East Central region slightly less. The average value of 92 g is considered to be more nearly correct than the value of 100 g as given by Woodruff.

In measuring flour, one sifting is considered sufficient except with old flour. Packing is thought to have an appreciable effect on the weight per cup if more than enough for one cup is sifted at a time. Another factor tending to increase weight is the piling of considerable flour on top of the cup before leveling. With the unavoidable variations in weight per unit volume, it is thought advisable where possible, particularly in large scale cookery, to weigh rather than measure the flour for batters and doughs.

II. *The result of the use of different wheats.*—Further factors shown to have an effect upon the weight of a given volume of flour are the variety of wheat and the conditions under which the wheat is grown (dry or irrigated soil).

Six samples of flour made from American Banner wheat and 6 from Berkeley Rock wheat grown in different types of soil averaged 87.4 and 103.3 g per cup, respectively. The range in weight for the first variety in the different soils was from 83.2 to 91.6 g and for the other from 98.8 to 105.5 g, showing that the type of soil had less effect than the variety of the wheat.

The average weights per cup of samples of flour from wheat of 10 different varieties grown on dry and irrigated soils were 102.9 and 105.7 g, respectively. The values for the individual samples were consistently higher for the wheat grown on irrigated than on dry soil.

III. *Causes for variation, milling, blending, handling, and time of storage.*—Factors shown in this paper to affect the weight of a given volume of flour are the size of the flour granules, the moisture content of the flour, the relative humidity of the atmosphere (because of its effect on moisture content), and the temperature of the room in which the measurements are made.

The effect of the size of the flour granules was measured in two ways, by separating the granules with different sized sieves and by using flour separated into grades. In both, the smaller the granules the less was the weight of the flour per cup. With decreasing moisture content the weight per cup increased very rapidly to a point between 8 and 7 percent moisture, after which there was a decrease in weight. In a room with low humidity an increase in temperature from 20° to 30° C. resulted in a decrease in the weight per cup of the flour.

The effect of variations in the moisture content of the flour is emphasized as of considerable importance in home baking. The loss in moisture and change of weight in flour retained in heated homes in winter affect the ratio of flour to liquid to such an extent as to introduce an error when the flour is measured by volume sufficient to account for some of the failures in cake baking.

Attention is called to the fact that throughout the entire work the commercially milled flours from soft wheat which were examined weighed less than 100 g per cup and hard flours more than 105 g per cup. Weight per given volume is recommended as a simple and fairly accurate means of distinguishing between soft wheat flour and hard wheat flour and blends.

Report of the committee on the standardization of laboratory baking, D. A. COLEMAN (*Cereal Chem.*, 9 (1932), No. 4, pp. 404, 405).—This annual report

(E.S.R., 65, p. 890) consists chiefly of recommendations based upon the final report on the baking research fellowship (E.S.R., 68, p. 559).

Measuring and recording some characteristics of test sponge cakes, W. PLATT and P. D. KRATZ (*Cereal Chem.*, 10 (1933), No. 1, pp. 73-90, figs. 10).—Methods which have been developed for recording and in some instances measuring quantitatively the characteristics of test sponge cakes are described. The quantitative measurements include the specific gravity of the batter by weighing a standard cupful, a determination used in measuring the beating quality of eggs; cake volume, by determining with a planimeter the area of a cross section of the cake; texture, by determining the compressibility and the elasticity with an apparatus previously developed for bread; and toughness, by a tensile strength apparatus. Methods for recording without actual measurement include shape by drawing the profile of the cross section, shape and grain by photography, and flavor by a scoring method.

A method for measuring the rate of inherent staling is being developed, which depends upon the tensile strength, compressibility, and ratio of the compressibility under different weights. "It is believed that the time rate of change of compressibility or of tensile strength could be used as measures of inherent staling. These in turn, over any given period, could be best expressed as the slope of the curve or as units of change per day. In this way the relative keeping qualities of two cakes made in different ways, but kept under the same conditions, could be expressed numerically and compared."

Some new facts about molds and bread, O. SKOVHOLT and C. H. BAILEY (*Minnesota Sta. Bul.* 296 (1933), pp. 12, figs. 3).—This discussion of the various factors influencing the rate and extent of mold growth in bread includes a brief report of new experimental evidence obtained in the laboratory and commercial practice. Among the points brought out are the following:

Bread which has received a thorough enough baking to be salable will contain none of the spores of common bread mold having the ability to grow and reproduce. Dust particles carry mold spores to the surface of the loaf where they may develop while the loaf is cooling, but a relative humidity of at least 90 percent is required for visible mold development. Bread containing 6 percent milk solids retains moisture within the loaf better than milk-free bread. This consequently retards the formation of moisture between the loaf and the wrapper and hinders mold development. Plant sanitation is considered to be of greater importance than thoroughness of baking and cooling in reducing mold formation.

The authors conclude that there is no justification for reducing the milk solids content of bread to prevent mold.

Conserving food value, flavor, and attractiveness in cooking vegetables, R. LOUGHLIN (*U.S. Dept. Agr. Circ.* 265 (1933), pp. 12, figs. 5).—This circular discusses the nutritive value of vegetables, points to be considered in their purchase, storage, and preparation for cooking and serving, and methods of cooking to preserve nutritive value, flavor, texture, and color, and describes methods suitable for cooking and serving different types of vegetables. A table is included giving the quantity as purchased required for 5 or 6 servings, preparation for cooking, and the time for baking, steaming, or boiling of the more important vegetables.

Cooking quality of potatoes, M. D. SWEETMAN and P. S. GREENE (*Maine Sta. Bul.* 363 (1932), p. 274).—This is a brief progress report (E.S.R., 66, p. 486) on the measurement of various qualities of potatoes in relation to their mealiness.

The microbiology of frozen foods, L. H. JAMES (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 12 (1932), No. 4, pp. 110-113, 119).—This contribution

from the U.S.D.A. Bureau of Chemistry and Soils consists of a concise review of the literature on the subject, with a bibliography of 36 titles.

The relative digestibility by rats of the milk of five breeds of dairy cattle, W. B. NEVENS and D. D. SHAW (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 5, pp. 463-472).—Following the technic and management described previously (E.S.R., 68, p. 561), the apparent digestibility of the fresh whole milk of five breeds of dairy cattle (Ayrshire, Brown Swiss, Guernsey, Holstein-Friesian, and Jersey) was studied at the Illinois Experiment Station by 10-day digestion trials with rats.

The coefficients of digestibility for fat were high and showed no significant breed differences, the average values lying within the small range of 98.2 ± 0.13 to 99 ± 0.07 . The protein values were somewhat lower, the averages ranging from 89.7 ± 0.36 to 92.3 ± 0.14 . The total solids had somewhat higher coefficients of digestibility than the proteins, the average values for the different breeds ranging from 91.8 ± 0.15 to 93.3 ± 0.15 . In both proteins and total solids the breed differences were likewise considered insignificant. The sugars were almost completely digested.

The question of the copper content of milk and milk preparations [trans. title], E. REMY (*Ztschr. Untersuch. Lebensmtl.*, 64 (1932), No. 6, pp. 545-548).—Tabulated data are given on the composition of 10 samples of milk and milk preparations, including 2 samples of breast milk, 2 of fresh cow's milk, and 1 each of pasteurized market milk, a special milk for children, fresh goat's milk, evaporated milk, dried skim milk, and Yoghurt milk. The data include physical constants, proximate analyses, ash analyses (including phosphate (PO_4), copper, iron, calcium, and potassium), and the reducing capacity for 2,6-dichlorophenol-indophenol according to the Tillmans method.

Special attention was given to copper on account of reports in the literature of wide differences in the copper content of milk of different species. The Elvehjem-Lindow modification of the Biazzo method was used for this determination. The differences in copper content of the various types of fresh milk examined were considered to be insignificant. The average value for the various samples of cow's milk was 0.131 and for the 2 samples of breast milk 0.139 mg percent. Goat's milk had a content of 0.09 mg percent. The calcium-phosphorus ratios averaged 1:1.3 for cow's milk and 1:1.26 for breast milk. One sample of breast milk and 1 of fresh cow's milk had a reducing capacity of 5 cc per 100 g. The other sample of fresh cow's milk gave a value of 15, pasteurized milk 8, special milk for children 4.4, goat's milk 10, and Yoghurt milk 6.6 cc per 100 g.

Iron and copper in liver and liver extracts, A. E. MEYER and C. EGGERT (*Jour. Biol. Chem.*, 99 (1932), No. 1, pp. 265-270).—Data are reported on the iron and copper content, as determined by the methods of Elvehjem and Peterson (E.S.R., 58, p. 191) and Elvehjem and Lindow (E.S.R., 61, p. 612), respectively, of the whole liver and various extracts of the liver of horse, dog, beef, and hog. "In the livers investigated, horse, hog, and dog livers are uniformly high in iron, whereas beef liver contains considerably less. The copper is highest in beef liver, less in dog, horse, and hog liver. Only a part of these metals can be extracted with water. They are accumulated in the fraction which is precipitated with 67 percent alcohol. The fraction obtained afterward with higher grade alcohol (up to 93 percent) contains less copper and very little iron."

Iodine in nutrition in coastal Mid-China, W. H. ADOLPH and P. C. WHANG (*Chinese Jour. Physiol.*, 6 (1932), No. 4, pp. 345-352).—The investigation previously noted (E.S.R., 64, p. 581) has been extended to a study of the Shanghai-Soochow area, an east Mid-China area adjacent to the sea. Iodine was

found in considerable amounts in the vegetable foods in this area. The highest amount reported was for cabbage, 776 parts per billion of dry material. The marine foods, both plant and animal, were all rich in iodine. The lowest amount reported was for fish bladder 480, and the highest for *Laminaria religiosa* 240,000 parts per billion of edible portion. Crude sea salt contained from 40 to 247 parts per billion and a crude well salt 926 parts per billion. The calculated average iodine intake for this region was from 32 to 66 γ per day. The region is considered to be nongoitrous.

The role of minerals and vitamins in growth and resistance to infection, A. BROWN and F. F. TISDALL (*Brit. Med. Jour.*, No. 3758 (1933), pp. 55-57, figs. 2).—This general discussion is based largely upon the authors' laboratory and clinical experience (E.S.R., 67, p. 490).

Some effects of chlorophyll in the diet of the albino rat, F. R. EDWARDS and K. T. HOLLEY (*Georgia Sta. Bul.* 173 (1932), pp. 11, figs. 7).—Essentially noted from a preliminary report (E.S.R., 66, p. 763).

The nature of the foodstuffs oxidized to provide energy in muscular exercise.—IV, **The use of protein as a fuel in exercise,** A. CANZANELLI and D. RAPPORT (*Amer. Jour. Physiol.*, 102 (1932), No. 2, pp. 325-331).—Following the same technic as in earlier studies of the series (E.S.R., 59, p. 891), the authors have determined the respiratory metabolism of a dog during rest and exercise on protein feeding after starvation and fat diet and after carbohydrate diet and on mixed protein and carbohydrate feeding. The conclusion is drawn that "protein is a normal source of oxidative energy for muscular exercise, and its nonnitrogenous split products are as readily available for this purpose as are carbohydrate and fat."

Vital need of the body for certain unsaturated fatty acids.—III, **Inability of the rat organism to synthesize the essential unsaturated fatty acids,** H. M. EVANS and S. LEPKOVSKY (*Jour. Biol. Chem.*, 99 (1932), No. 1, pp. 231-234, figs. 2).—Evidence is presented showing that the body fats of rats reared on complete diets contain appreciable amounts of the fatty acids previously demonstrated to be essential (E.S.R., 67, p. 773), and that these substances are absent or greatly reduced in the carcass fat of rats reared on fat-free diets.

Ketosis during fasting in Eskimos, P. HEINBECKER (*Jour. Biol. Chem.*, 99 (1932), No. 1, pp. 279-282).—Supplementing earlier studies on the metabolism of Eskimos during fasting, three full-blooded Eskimo women in the same locality as in the previous study (E.S.R., 67, p. 87) were subjected to a 7-day fast, during which time daily collections of the urine were taken for analysis. The data obtained were consistent with those of the earlier studies in showing a lesser degree of ketosis on fasting than is the case with the average white person living in a temperate zone. One subject developed a much greater degree of ketosis than the other two, showing that even in the Eskimo the power to oxidize fats to completion is limited. It is thought that glucose, when available for oxidation, limits the demand for the oxidation of fat, thus tending to keep the subject above the threshold of ketosis.

On the motion of growth.—I, **Introduction to the energetics of growth and metabolism.** II, **Human growth in weight from early fetal to adult life.** III, **The determination of ρ and the energetics of human basal metabolism,** N. C. WETZEL (*Soc. Expt. Biol. and Med. Proc.*, 30 (1932), No. 2, pp. 224-227; 227-232, figs. 2; 233-236, fig. 1).—These three papers summarize "the major results of an extensive investigation into the general nature and mechanism of growth." In the first a mathematical equation is developed for the energetics of growth. This is applied in the second paper to the case of human growth in weight from the one-hundredth day of gestation to full adult life and in the third to the course of human basal metabolism through

the same period in terms either of unit or total heat production. The theoretical values obtained in the metabolism calculations are shown to have good agreement with actual values reported by Benedict and his associates.

Cost of work in relation to basal metabolism, J. T. McCLINTOCK and S. PAISLEY (*Soc. Expt. Biol. and Med. Proc.*, 30 (1932), No. 2, pp. 162, 163).—Following the procedure of Benedict and Murschhauser (*E.S.R.*, 34, p. 260), the authors have determined the extra energy output caused by walking for 65 children, boys and girls, ranging in age from 11 to 14 years, with average values for cost per horizontal kilogram-meter of 0.6449 gram-calorie for the boys and 0.5949 for the girls. It was found that the general average for the entire group of boys was approximately 20 percent higher than the value of 0.538 gram-calorie reported by Smith (*E.S.R.*, 47, p. 562) as an average for 8 normal men. The average basal metabolic rate for the group of boys was 47.5 calories per square meter body surface, as calculated from the tables of Du Bois. This value was also 20 percent higher than that given for adult men in the same tables.

The suggestion that the energy cost of walking is directly proportional to the basal metabolic rate, as brought out by these results, led to calculations of the probable cost of walking for the different age groups of boys and girls in the present study by use of the Du Bois tables of basal metabolic rates for different ages. The figures, although not in perfect agreement with the determined values, were in such close accord as to justify the conclusion that the unit cost of work, such as walking, in normal individuals varies directly with the basal metabolic rate.

Vitamins and hormones: Their genetic, synergistic, and antagonistic relationship [trans. title], J. KÜHNAU and W. STEPP (*München. Med. Wchnschr.*, 80 (1933), No. 3, pp. 87-92).—The authors review and discuss recent literature, mostly from German sources and largely theoretical, pointing to an intimate relationship, either supplementary or antagonistic, between various vitamins and hormones.

Vitamin A in six varieties of frozen cherries, M. T. POTTER and M. A. DICKSON (*Jour. Home Econ.*, 25 (1933), No. 1, pp. 47-52, fig. 1).—In this contribution from the Washington Experiment Station, data are reported on the vitamin A content, as determined by the Sherman-Munsell method with slight modifications, of several types of cherries which had been frozen in the raw state and stored at subzero temperature. The quantities of the different types estimated to contain 1 unit of vitamin A were as follows: Montmorency (sour) between 0.25 and 0.375 g, closer to the lower level; Late Duke (hybrid) between 0.25 and 0.375; Royal Ann (sweet) between 0.25 and 0.375, closer to the upper level; Bing (sweet) approximately 0.375; and the Deacon and Lambert (both sweet) above 0.375 g.

"The cherry compares favorably with other fruits in vitamin A potency and may be ranked among the fruits as a rich source of this dietary factor."

The properties of halibut-liver oil, R. T. M. HAINES and J. C. DRUMMOND (*Brit. Med. Jour.*, No. 3769 (1933), pp. 559-561, fig. 1).—Data are reported on the physical and chemical constants of 8 samples of halibut-liver oil, 7 of which were known to be uncontaminated. Data are also included on the amounts of unsaponifiable matter in the oil, the iodine value and percentage of cholesterol in the unsaponifiable fraction, the vitamin A blue values as determined by the antimony trichloride test for the oils and corresponding unsaponifiable fractions, the content of vitamin A of 4 of the oils as determined by R. J. MacWalter by means of the Hilger spectrophotometer, and the calculated loss of vitamin A from these oils on extraction.

A graph correlating the values for the extinction coefficient at 3,280 Å in a concentration of 1 percent with the blue values obtained in the antimony trichloride test on these oils showed a striking straight line relation which is thought to point to the trustworthiness of the antimony trichloride test for determining the vitamin A values of halibut-liver oils of high potency.

Attention is called to the fact that direct treatment of halibut liver with live steam, which readily liberates oil from cod liver, does not break up the tissue and release the oil.

Vitamin A and the growth-promoting action of the egg yolk of birds [trans. title], H. VON EULER and E. KLUSSMANN (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 208 (1932), No. 1-3, pp. 50-54).—The literature on the carotenoid pigments in egg yolk, including previous studies from the senior author's laboratory, is reviewed briefly, and experiments are reported in which an attempt was made to determine by comparisons of the absorption spectra some quantitative relationship between vitamin A and carotenoid pigments in egg yolk. A concentrate was prepared from egg yolk by coagulation with alcohol, extraction of the residue with ether, saponification of the extract, and further extraction with ether. After evaporation of the ether, the residue was dissolved in chloroform and examined spectroscopically.

Absorption bands were identified at 489, 457, and 430 mμ. The reaction product with antimony trichloride showed bands at 585 and 625 mμ. These values are not identical with those of vitamin A from cod-liver oil or with zeaxanthin or xanthophyll. A mixture of 30 percent zeaxanthin and 70 percent xanthophyll (the proportions in which these pigments are considered to be present in egg yolk) gave absorption bands with the antimony trichloride reagents at 589 and 660 mμ, and the same mixture with the addition of a highly concentrated vitamin A preparation values at 584 and 622 mμ.

A method of enhancing the vitamin A value of cod liver oil, E. R. JANES, H. F. GROVER, and E. J. QUINN (*Soc. Expt. Biol. and Med. Proc.*, 30 (1933), No. 4, pp. 516-519, fig. 1).—An emulsion of cod-liver oil with malt extract, prepared by thoroughly agitating a mixture of 22.37 percent by weight of high-grade cod-liver oil with 77.63 percent of concentrated malt extract in a specially constructed apparatus operated under reduced pressure, was found to be superior as a source of vitamin A to the same amount of plain cod-liver oil or plain cod-liver oil plus the extract fed separately. In the comparison the Sherman technic was followed, the supplements being fed after the rats had ceased to grow and showed other symptoms of vitamin A depletion. Nine animals receiving 0.8948 mg of cod-liver oil daily in the form of the emulsion made an average gain of 39.7 g in the 35-day test period and were cured of all symptoms of vitamin A deficiency. In both of the other groups several of the animals died before the end of the test period, and those surviving made poor growth or lost weight and showed more or less severe xerophthalmia at the end of the test period.

The authors are of the opinion that the fine subdivision of the oil in the emulsified product favors a more complete absorption and utilization of the vitamin.

How does heating affect the vitamin A content of milk? [trans. title], M. LUNDEORG (*Biochem. Ztschr.*, 259 (1933), No. 1-3, pp. 27-29).—Fresh milk was found to have a vitamin A content equivalent to 7.6, milk pasteurized by heating for 30 minutes at 63° C. a value of 3, and milk brought to boiling in 10 minutes and cooked for 2 minutes a value of 6.7 Lovibond blue units per gram of fat. These figures are thought to point to a considerable destruction of the vitamin A content of milk on pasteurization by the holding process.

Carotene and vitamin A, H. GOLDBLATT and H. M. BARNETT (*Soc. Expt. Biol. and Med. Proc.*, 30 (1932), No. 2, pp. 201-204).—Crystalline carotene dissolved in Wesson oil and carrot oil diluted with Wesson oil were fed in graded doses of from 0.00025 to 0.008 mg of carotene content, as determined colorimetrically by comparison with $K_2Cr_2O_7$ solutions, as the sole source of vitamin A to rats which had ceased gaining weight for about 2 weeks on a vitamin A-deficient diet.

Three animals receiving the carotene solution in amounts equivalent to 0.00025 mg of carotene daily lost weight and died, one in 4 and the other two in 3 weeks, and two receiving 0.0005 mg gained 2.8 and 2.9 g, respectively, in the 8 weeks' period. In the experiments with diluted carrot oil one animal receiving 0.00025 mg daily lost weight but lived 4 weeks and the two receiving 0.0005 mg daily gained 3.9 and 3.8 g, respectively, in the 8 weeks' period. The authors, ignoring these slight differences, state that "the results show that of each solution a quantity containing 0.0005 mg (0.5 λ) of carotene was the minimum that just satisfied the requirements for a Sherman unit of vitamin A, that is, an average gain of 3 g per week for 8 weeks." They conclude that carotene is the only growth-promoting factor of the nature of vitamin A in carrots and the only pigment of any consequence in carrot oil.

Determinations of carotene in the endocrine glands of cattle [trans. title], R. NETTER (*Bul. Soc. Chim. Biol.*, 14 (1932), No. 10, pp. 1555-1559).—Following the same technic as in a previous study of the carotene content of ox adrenal glands (E.S.R., 66, p. 607), the author has obtained crystals of carotene from bovine ovaries, testicles, and hypophyses, but not from the thymus and thyroid glands.

The role of carotenoids in the animal body [trans. title], H. VON EULER and E. KLUSSMANN (*Biochem. Ztschr.*, 256 (1932), No. 1-3, pp. 11-17).—In the first part of this report data previously obtained on chickens and new data on pigeons are summarized, showing the utilization in these species of xanthophyll in a manner similar to the utilization of carotene in mammals. In part 2 evidence is presented indicating that xanthophyll bears the same relation to vitamin E that carotene does to vitamin A.

Infection of accessory sinuses in vitamin A deficiency: The rôle of carotene in infection of the upper respiratory tract, R. G. TURNER and E. R. LOEW (*Jour. Infect. Diseases*, 52 (1933), No. 1, pp. 102-120, figs. 5).—Tests of the value of carotene as a source of vitamin A in the cure of infections of the upper respiratory tract of rats are reported, together with preliminary data regarding the stability and potency of solutions of carotene in olive oil, with and without certain stabilizers. The bacteriological technic was essentially the same as that followed in the previous study (E.S.R., 61, p. 292).

Carotene alone in olive oil remained unchanged in color from 20 to 30 days, in the same oil containing 0.1 percent quinhydrone from 30 to 60 days, and in the same oil containing 0.1 percent hydroquinone from 90 to 120 days or longer. Solutions of carotene containing 0.1 percent of vanillin faded more rapidly than those containing carotene alone, losing their color in from 10 to 20 days. Solutions kept in nitrogen faded more rapidly than those in contact with air.

In the animals receiving unfaded carotene, the dosage in general ranging from 0.049 to 0.14 mg daily, the percentage incidence of bacteria in the nasal cavities and middle ear was noticeably less than in the animals given faded carotene or receiving no source of vitamin A. The number of spontaneous suppurative lesions in the upper respiratory tract was reduced, xerophthalmia was cured in all of the animals, and normal health was regained in 74 percent.

The authors are of the opinion that carotene is more effective against invasion of bacteria in the upper respiratory tract than cod-liver oil, but state that

"before accurate data can be obtained regarding the standardization of carotene or comparison of it with cod-liver oil or vitamin A concentrates its stability must be assured, and the solvent used for administration must be of a nature most favorable for the absorption of carotene from the intestinal tract."

Blood cholesterol in dogs on an A deficient diet, E. P. RALLI and A. WATERHOUSE (*Soc. Expt. Biol. and Med. Proc.*, 30 (1933), No. 4, pp. 519-523).—Observations on the level of blood cholesterol in four dogs on a vitamin A-deficient diet are reported, showing a rise in cholesterol values coincident with the development of symptoms of vitamin A deficiency and a fall subsequent to the administration of a cod-liver oil concentrate or carotene. These findings are thought to substantiate the conclusions of other investigators that the metabolism of cholesterol is affected by the quantity of vitamin A available.

Influence of cooking and canning on the vitamin B content of beef and pork, F. W. CHRISTENSEN, E. LATZKE, and T. H. HOPPER (*Amer. Soc. Anim. Prod. Proc.* 1932, pp. 365-368).—In this study at the North Dakota Experiment Station, cuts of beef and pork were freed from visible fats, ground finely in a meat chopper, and divided into three parts. One of these parts was dried in a current of cool air at a temperature varying from 48° to 57° C., another cooked in a double boiler with frequent stirring until a temperature of 92° was reached and then cooled, dried, and ground, and a third packed in no. 2 tin cans, sealed, heated in a pressure cooker for 60 minutes at 15 lb. pressure, cooled, and the contents removed from the can, dried, and ground. All of the samples were finally packed in ½-pt. fruit jars, evacuated, sealed under partial vacuum, and kept in an electric refrigerator until needed.

In testing the meats for vitamin B, the pork was fed at a level of 0.45 g of the dried material, with average weekly gains of 4.7 for the raw, 4.2 for the cooked, and 3.4 g for the canned meat. All of the animals survived, and nearly all were in good condition at the end of the experiment. The beef was fed at levels of 4, 4.5, and 6 g per week. The gains on 4.5 g weekly were 3.9 g for the raw and 3 for the cooked, while there was a loss of 3.8 g on the canned beef. The animals receiving the canned beef did not eat as much of the basal diet or the beef as did the others.

The authors conclude that the pork used was 10 times as potent in vitamin B as the beef, and that there was some destruction of vitamin B on cooking at the lower temperature and still greater destruction on cooking in the usual pressure cooker. "The irregular results obtained with the beef suggest that possibly some unrecognized factor is involved, or that pork contains some factor, not found in beef, which protects vitamin B from destruction in the pressure cooker."

The sparing action of fat on vitamin B, IV, V, H. M. EVANS and S. LEPKOVSKY (*Jour. Biol. Chem.*, 99 (1932), No. 1, pp. 235-240, figs. 3).—In continuation of the series noted previously (E.S.R., 67, p. 778), two papers are presented.

IV. *Is it necessary for fat to interact with vitamin B in the alimentary canal to exert its sparing effect?* (pp. 235, 236).—The question as to whether or not the beneficial effects of fat upon vitamin B are the result of the interaction of the two in the alimentary canal was answered in the negative by experiments in which litter-mate female rats reared on either a fat-free diet or one containing 25 percent cottonseed oil were given vitamin B at two levels by mouth and by interperitoneal injection. Although the growth response to vitamin B administered parenterally is always slightly less than when administered by mouth, the addition of fat to the diet caused practically the same improvement in growth in the animals receiving the vitamin in the two ways.

V. *The role of glycerides of oleic acid* (pp. 237-240).—With the use of the same technic as in the third paper of the series, tests were made of the sparing action for vitamin B of the glycerides of purified and commercial oleic acid. In an attempt to simulate a natural fat, the glycerides of commercial oleic acid and stearic acid were mixed in the proportion of 60 parts of the former to 40 of the latter and likewise tested for their sparing action.

In tests in which there was an inadequate supply of vitamin B, the results with the glycerides of commercial oleic acid were inferior to those with the glycerides of pure oleic acid which were as effective as natural fats. With adequate vitamin B, the glycerides of the commercial oleic acid were utilized nearly as well as those of purified oleic acid. Growth on the mixture of the glycerides of commercial oleic and stearic acids was superior to that on either one alone.

Coprophagy as a source of vitamin B (B_1), L. E. BOOHER and T. KANEKO (*Soc. Expt. Biol. and Med. Proc.*, 30 (1932), No. 1, pp. 69-73, figs. 2).—Eleven rats fed the Sherman-Chase (E.S.R., 66, p. 410) vitamin B (B_1)-deficient diet containing 53 percent of raw cornstarch supplemented with from 66 to 97 percent of their own feces lived longer and lost weight less rapidly or grew at a slower rate than the controls without the supplement. Only one of the group developed polyneuritis. This one and two others died before the end of the 8 weeks' experimental period. All of the animals in the control group died within the usual time, from 24 to 33 days after they had ceased to grow. Inasmuch as the greatest growth in the feces-fed group was only 4 g per week and most of the animals grew at a much slower rate or lost weight steadily, although more slowly than the control animals, the authors conclude that vitamin B (B_1) studies by the Sherman-Chase method are not seriously affected by the influence of coprophagy.

An improvement in experimental method for investigation of vitamin G, J. W. PAGE (*Soc. Expt. Biol. and Med. Proc.*, 30 (1932), No. 1, pp. 87, 88, fig. 1).—A small aluminum and leather harness for rats, designed to prevent the practice of coprophagy, is described and illustrated. Contrary to the findings of Booher and Kaneko, noted above, that coprophagy does not affect vitamin B (B_1) experiments, this practice has been found to interfere seriously with the accuracy of vitamin G (B_2) determinations. Data are given showing that the use of the harness described not only shortens the period necessary for the young rats to reach stationary weight on the vitamin G-deficient diet, but also makes the animals lose weight more rapidly and uniformly.

The effect of parboiling and milling on the antineuritic vitamin (B_1) and phosphate content of rice, W. R. AYKROYD (*Jour. Hyg. [London]*, 32 (1932), No. 2, pp. 184-192).—Samples of highly milled parboiled rice were found to be rich in vitamin B (B_1), while roughly milled raw rice was deficient in this vitamin. The polishings from parboiled rice contained less vitamin B than those from raw rice.

In the process of parboiling unhusked rice is soaked in water for from 24 to 36 hours, subjected to steam at atmospheric pressure for from 15 to 20 minutes, and subsequently dried in the sun. It is thought that in the steaming process the water-soluble vitamins contained originally in the germ and pericarp diffuse through the endosperm and are consequently not so completely removed on milling.

Vitamins B_1 and B_2 in tissues of normal and experimental rats, C. E. GRAHAM and W. H. GRIFFITH (*Soc. Expt. Biol. and Med. Proc.*, 29 (1932), No. 6, pp. 695-697).—The body tissues of rats on a stock diet were found to contain more vitamin B_2 than B_1 , although not a rich source of either, and to be richer in vitamin B_1 than the tissues of rats fed the Evans and Burr vitamin B-free

diet supplemented with cod-liver oil, and with tikitiki and autoclaved liver as sources of vitamins B₁ and B₂, respectively. These results are thought to point to a more rapid depletion of vitamin B₁ than B₂ in the body tissues. It is also suggested that the sustained but subnormal appetite of rats on vitamin B₂-deficient diets, as noted in a previous report (E.S.R., 66, p. 93), may have been due to the presence of residual vitamin B₂ in the tissues, while the well-known failure of appetite in vitamin B₁ deficiency may be due to the more complete depletion of the tissues in vitamin B₁.

Production in dogs of a syndrome similar to sprue by diets deficient in vitamin B₂. D. K. MILLER and C. P. RHOADS (*Soc. Expt. Biol. and Med. Proc.*, 30 (1933), No. 4, pp. 540, 541).—The diet used in the production of this syndrome was a modification of the Goldberger blacktongue-producing diet and consisted of the following ingredients: White corn meal 4,000, ground California black-eyed peas 500, washed casein 500, sugar 300, cottonseed oil 300, cod-liver oil 200, salt mixture (Cowgill) 50, and rice polishings 400 g. The corn meal, peas, and casein were mixed and cooked 2 hours in a steam cooker, after which the other ingredients were added. The animals were fed the diet ad libitum.

Some, but not all, of the 50 animals acquired symptoms similar in all respects to sprue. All of the animals lost weight. Blood changes were definite in 60 and striking in 30 percent. In the latter the average red cell count dropped from 6.44 millions to 3.105 millions and the hemoglobin from 87.7 to 56.4 percent. In the animals with severe anemia there were striking alterations in the bone marrow. In the long bones, the marrow, which is normally fatty, "was completely replaced by solid, deep purple-red tissue, macroscopically indistinguishable from the marrow of cases of pernicious anemia. Histological studies showed proliferation of endothelial cells and of megaloblasts with little tendency to maturation. The histopathological picture was quite similar to that seen in cases of sprue anemia or in pernicious anemia."

The Winesap apple as a source of vitamin C. M. T. POTTER (*Jour. Home Econ.*, 25 (1933), No. 1, pp. 52-56).—In this study, in which the author had the cooperation of E. L. Overholser, Winesap apples from trees not fertilized and from trees receiving applications of complete fertilizer were tested for their vitamin C content. Fruit of medium size, averaging 125 apples to the box, was harvested in October and stored at about 45° F. through the experimental period, which extended from November 3 to February 15.

The samples, which were prepared just before each feeding by wiping, coring, quartering, grinding finely, and weighing, were fed to guinea pigs in quantities of 5, 10, and 15 g daily. Of the 11 animals receiving the smallest quantity, 3 showed no scurvy, 3 mild, 3 moderate, 1 severe, and 1 very severe scurvy. All but 1 of the 12 receiving 10 g and the 2 receiving 15 g daily were protected from scurvy.

It was concluded that the level of protection for the Winesap variety is in the neighborhood of 10 g. In view of the variable responses of the animals receiving 5 g, the study noted below was undertaken to determine the possible effect of fertilization upon the vitamin C content of the Winesap apple.

The vitamin C content of the Winesap apple as influenced by fertilizers. M. T. POTTER and E. L. OVERHOLSER (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 4, pp. 367-373).—Using the same methods as in the study noted above, the authors have compared at the Washington Experiment Station the vitamin C content of Winesap apples from trees receiving applications of a complete fertilizer with those from trees on neighboring plats not fertilized. The apples were fed at a 5-g level in order that even slight differences in potency might be detected.

Of the 15 animals receiving apples from the nonfertilized trees, 4 died with marked scorbutic symptoms before the end of the experimental period, nearly

all lost weight, and all but 3 showed evidence of scurvy on post-mortem examination. The average scurvy score for the group was 10.6. Of the 15 animals receiving apples from fertilized trees, only 3 died of scurvy and the average scurvy score for the entire group was 6.

The data suggest that Winesap apples from trees receiving applications of a complete fertilizer appear to be a better source of vitamin C than apples from unfertilized trees. However, it is emphasized that these findings should not be interpreted as indicating that Winesap apples are an unsatisfactory source of vitamin C unless from trees receiving applications of a complete fertilizer. Differences were not apparent when the fruit was fed at the higher, 10-g, level.

Estimation and distribution of ascorbic acid (vitamin C) and glutathione in animal tissues, T. W. BIRCH and W. J. DANN (*Nature [London]*, 131 (1933), No. 3309, pp. 469, 470).—Data are tabulated on the ascorbic acid content, as determined by the authors' modification of the indophenol titration of Tillmans, of rat blood, muscle, liver, and kidney; sheep liver and eye lens; pig liver; rabbit liver and kidney; guinea pig liver (normal and scorbutic); and ox suprarenal cortex, together with the total quantity of iodine required for reduction of 1 g of the same tissues and the calculated quantities required for ascorbic acid determination, and the percentage of the iodine titer due to ascorbic acid.

The values reported show that tissues known to be rich in glutathione also have a high ascorbic acid content. "This coincident occurrence of the two substances has led us to formulate the working hypothesis that ascorbic acid and glutathione may be two linked factors in one system of oxidation in the animal cell. This has already led to the discovery of a thermolabile agent which is a catalyst for the dehydrogenation of ascorbic acid."

The effect of high doses of irradiated and non-irradiated ergosterol on the albino rat, J. T. HAUCH (*Soc. Expt. Biol. and Med. Proc.*, 30 (1933), No. 4, pp. 475-477).—This report summarizes the results obtained in a long-continued investigation of the toxicity for rats of doses of irradiated ergosterol, including a commercial preparation and a laboratory irradiated product varying from 100 to 465,000 times the therapeutic dose. The animals were kept on a stock diet and various rickets-producing diets, and the experiments were carried through several generations. Blood calcium and phosphorus determinations were made on representative animals at different stages, and all of the animals sacrificed or found dead were autopsied and microscopic sections of the various organs studied.

Toxic effects were not obtained except with extremely high doses. In animals on the stock diet with bread and milk, the first evidence of toxicity reported in adults was with a dosage of 93,000 times the curative dose administered for 12 months. Both young and adult rats on the stock diet, including bread and milk, plus 465,000 times the therapeutic dose showed immediate toxic effects. A change to a rickets-producing diet increased the susceptibility.

The results are thought to afford additional evidence that the toxicity of irradiated ergosterol is determined in part by the character of the diet, the more complete and better balanced diets acting in a more protective way.

Comparison of bone ash of rachitic rats treated with viosterol and with phosphate ion, C. A. LILLY (*Soc. Expt. Biol. and Med. Proc.*, 30 (1932), No. 2, pp. 175, 176).—Three groups of 7 rats each were placed at weaning on the Steenbock rachitic diet 2965, in one group unsupplemented, in another supplemented with viosterol equivalent in vitamin D potency to 3 percent of cod-liver oil in the diet, and in the third supplemented by $\text{Na}_2\text{HPO}_4 \cdot 12\text{H}_2\text{O}$ in amounts equivalent to furnish 0.4 percent of the secondary phosphate. After 28 days the animals were killed for ash determinations of the femurs. The ash content of

the femurs of the control animals was 28 percent and of the other two groups 45 percent of the wet weight of the bones.

These findings are thought to demonstrate that "the addition of Na_2HPO_4 in adequate amounts to a low phosphorus rachitogenic diet produces a bone ash comparable to the bone ash produced by adding pure vitamin D to such a diet."

Studies on vitamin G (B_2) with special reference to protein intake, H. C. SHERMAN and I. A. DERBIGNY (*Jour. Biol. Chem.*, 99 (1932), No. 1, pp. 165-171).—In the experiments reported, different levels of protein intake (6, 12, and 18 percent), were tested as to their influence upon the development of the so-called pellagra-like condition in rats on diets markedly deficient and only slightly deficient in vitamin G. An additional control group received a diet containing 6 percent protein and supplemented with a liberal supply of vitamin G.

In the two series of experiments with varying protein intake, the average rate of growth during the 8 weeks increased with the protein intake, the differences being greater between 6 and 12 percent than between 12 and 18 percent. The length of survival of the animals on inadequate vitamin G was also influenced by the protein intake. On the lowest intake none of the animals survived beyond 20 weeks, while 30 percent of those receiving 12 percent protein and 44 percent of those receiving 18 percent protein survived beyond this period.

One of the symptoms of vitamin G deficiency, the loss of hair in bilaterally symmetrical areas on the shoulders and back and around the eyes, was likewise more pronounced in the animals receiving only 6 percent protein. The results of the investigation are thought to give some credence to the earlier belief that protein supply had some bearing on the pellagra problem. "And insofar as the pellagra problem is to be regarded as nutritional, one should think not in terms of a choice between 'protein theory' and 'vitamin theory', but rather of a theory broad enough to take account of the possible participation of more than one nutritional factor."

Studies on vitamin G with special reference to protein intake, I. A. DERBIGNY (*Diss., Columbia Univ., New York, 1932, pp. 22, figs. 2*).—A more detailed report of the investigation noted above.

A new symptom complex in vitamin-G deficiency in rats, S. G. SMITH (*Soc. Expt. Biol. and Med. Proc.*, 30 (1932), No. 2, pp. 198-200, fig. 1).—In addition to the symptoms previously described in the literature as occurring in rats on vitamin G-deficient diets, the author observed in rats surviving longer than 70 days on the Sherman-Bourquin vitamin G-deficient diet (*E.S.R.*, 66, p. 410) a characteristic dermatitis of the tail. This is described as a coating of brownish-yellow waxy material, growing progressively worse until the animal died or was given a vitamin G supplement, such as yeast autoclaved for $2\frac{1}{2}$ hours at 15 lb. pressure, following which the condition gradually cleared up. Histological examination of sections of the tails of rats which had been maintained for 226 days on the deficient diet showed thinning and disorganization of the epithelium, almost complete atrophy and disintegration of the sebaceous glands, and atrophy and fragmentation of the fibrillar material in the corium, but with no cellular infiltration. These changes were also observed in the one animal of the 18 studied which died at the end of 70 days without showing any gross lesions.

In animals which were given the autoclaved yeast at a level of 10 percent of the diet for 36 days after the 226 days on the deficient diet, similar histological studies of sections of the tail showed complete regeneration of the epithelium and return to normal of the sebaceous glands and corium.

The same symptom complex was observed in 17 rats on a diet similar to that on which human beings frequently developed pellagra (white corn meal, pork fat, cane sirup, white flour, and cane sugar). The tail lesions did not develop

in rats deprived of food but not water or water but not food, although in the latter group blood staining of the wrists, mouth, eyes, and nose often described as characteristic of vitamin G deficiency developed. Sections made from the tails of 16 control rats were entirely normal.

Hemoglobin regeneration in the anemic albino rat with dietary supplements of spinach, apricot, and liver, C. J. FARMER and H. E. CORY (*Soc. Expt. Biol. and Med. Proc.*, 29 (1932), No. 6, pp. 766-769, figs. 2).—The spinach and apricots used in this study were commercially canned samples, plain and puréed. These and beef liver were compared for hemoglobin regenerating potency by the usual rat-feeding tests. The depletion period was long, 70 to 80 days, during which time the hemoglobin content decreased from an initial value of 11 or 12 g to from 3.6 to 4.8 g per 100 cc of blood.

Hemoglobin regeneration to normal values was secured with 5 g of the puréed spinach, furnishing only 0.091 mg of iron. More rapid regeneration was secured with 10 and 20 g daily, but even the largest amount fed had an iron content of only 0.364 mg. The copper content in all cases was equal to or above the accepted minimum. The puréed samples of both spinach and apricots were more effective than the nonpuréed. Beef liver was about twice as effective as nonpuréed apricot and this in turn as the spinach, the approximate ratio of 4:2:1 being about the same as reported by Robschey-Robbins and Whipple (*E.S.R.*, 63, p. 897) for the relative efficiency of these materials for blood regeneration in dogs rendered anemic by bleeding. It is noted that hemoglobin regeneration was insignificant with acid solutions of the ash obtained from 5 g of puréed spinach, and also that chlorophyll extracted from 5 g of spinach appeared to have a toxic action.

Values are given for the iron and copper content of samples of puréed and leaf spinach.

Experimental rickets as a phosphorus deficiency disease, H. D. KAY and B. L. GUYATT (*Nature [London]*, 131 (1933), No. 3309, pp. 468, 469).—Evidence is presented briefly in support of the theory that a chronic defect of phosphorus "is the most important single factor in the production of experimental rickets in rats. This is very probably true in a large proportion of cases of human rickets also, vitamin D being of importance in the rat or human dietary only insofar as its presence enables the organism to increase the net intestinal absorption of phosphorus from the food."

A second factor of importance is the diminution of the phosphoric ester content of the red blood cells, which has been shown to increase following the administration of vitamin D.

Changes in phosphoric ester content of the red blood cells and the liver in experimental rickets, H. D. KAY (*Jour. Biol. Chem.*, 99 (1932), No. 1, pp. 85-94).—Evidence is presented showing that in experimental rickets in rats there is a slight fall in the kidney phosphatase, a slight rise in the bone phosphatase, and a fall in the intestinal phosphatase. It is also shown that various organs, particularly the liver and red blood cells, have a much lower content of acid-soluble phosphoric esters in experimental rickets, and that the addition of therapeutic agents causes an increase toward normal values.

These findings are considered to be of interest in connection with the phosphatase theory of salt deposition in growing bones, for it is pointed out that the bone enzyme, although not diminished in rickets, suffers from shortage of inorganic phosphate in the blood and of the phosphoric esters of the red blood cells.

The intestinal flora of rachitic rats before and after treatment with ultra-violet rays, A. F. HESS and J. C. TORREY (*Soc. Expt. Biol. and Med. Proc.*, 29 (1932), No. 6, pp. 761-766).—Only slight differences were noted in the bacterial flora in the intestines of normal, rachitic, and irradiated rats, although

there were marked differences in the pH of the intestinal contents which were more acid in the irradiated animals. These findings are thought to indicate that the change in reaction toward acidity following ultraviolet irradiation is due to an alteration in metabolism and not the result of bacterial activity.

Growth-promoting rachitogenic diets for rats, T. F. ZUCKER, L. HALL, L. MASON, and M. YOUNG (*Soc. Expt. Biol. and Med. Proc.*, 30 (1933), No. 4, pp. 523-525).—Criticism of lack of satisfactory growth in rats on the customary rickets-producing diets has been met by the development of two new rickets-producing diets which at the same time promote satisfactory growth for the period required. The limiting factor in previous diets was considered to be vitamin B (complex). Rice polishings were found to be more satisfactory than yeast for making up this deficiency. The first of the two diets, diet 746, which is said to have given good growth during a 3 weeks' experimental period, consists of casein 5 parts, egg albumin 5, patent flour 76, NaCl 2, spintrate 1, rice polishings 7, milk concentrate 1, cottonseed oil 2, and CaCO₃ 1 part. The other, diet 728, contains egg albumin 10, wheat gluten 10, and cornstarch 65.5 parts in place of the casein, egg albumin, and patent flour. The other constituents are the same except for 1.5 parts CaCO₃ in place of 1 in the other diet. The second diet is said to be very suitable for 7-day preventive tests. At the end of this time determinations of inorganic blood phosphate showed a mean of 3.7 mg percent for rachitic animals, 4.7 with partial, and 7.3 with complete prevention by cod-liver oil. Figures for bone ash obtained on the fat extracted dried femurs gave averages of 42 percent for the rachitic and 46 percent for the nonrachitic animals.

Prevention and cure of rickets in rats and antirachitic activation of ergosterol by cold quartz mercury lamp, H. GOLDBLATT (*Soc. Expt. Biol. and Med. Proc.*, 30 (1932), No. 3, pp. 380-383).—The effectiveness of the cold quartz mercury lamp in the prevention and cure of rickets was tested on rats receiving the Steenbock-Black rickets-producing diet 2965. In the preventive tests, exposure of part of the back at a distance of 5 in. from the lamp for a period of 3 seconds daily afforded complete protection. In the curative tests an exposure of 10 seconds daily induced advanced or complete healing in 2 weeks, while one of 5 seconds daily gave variable results. Longer periods of radiation in the preventive tests were without harmful effect except a change in the coloration of the fur to light yellow in animals irradiated for more than 1 minute daily. In the curative tests, animals irradiated for from 15 to 120 seconds daily showed complete healing in 2 weeks and those irradiated for 45 seconds or longer advanced healing in 1 week.

The exposure of 0.2 percent solution of ergosterol in olive oil to radiation at the same distance, 5 in., from the lamp, for 1, 5, 10, 20, and 30 minutes resulted in the antirachitic activation of all of the solutions. These were diluted so that 1 drop (0.025 cc) contained 0.002 mg of irradiated ergosterol and 0.001 cc of irradiated oil. This quantity of the solution irradiated for only 1 minute was sufficient to prevent and cure rickets in rats.

The antirachitic efficiency of New Orleans sunshine, H. S. MAYERSON and H. LAURENS (*Amer. Jour. Physiol.*, 102 (1932), No. 2, pp. 422-438).—Essentially noted from other sources (*E.S.R.*, 69, pp. 313 and 410).

Ultraviolet light intensity in Puerto Rico, II, L. G. HERNÁNDEZ (*Puerto Rico Jour. Pub. Health and Trop. Med.*, 8 (1932), No. 2, pp. 249-254).—In continuation of the investigation noted previously (*E.S.R.*, 66, p. 493), readings for the solar radiation in San Juan, P.R., as determined by the oxalic acid uranyl sulfate method, are reported for a 5-month period from April 1 to August 31, 1931, inclusive. The maximum reading obtained was 10.96 mg of oxalic acid decomposed per square centimeter for one hour on June 18, 1931. This figure

approximates closely the value of 10.81 mg obtained at the Texas Experiment Station in the summer of 1931 and reported in a private communication from M. A. Grimes.

Relation of adrenal cortex to development of scurvy, J. E. LOCKWOOD and D. G. and F. A. HARTMAN (*Soc. Expt. Biol. and Med. Proc.*, 30 (1933), No. 4, pp. 560-562, fig. 1).—In this preliminary report, scurvy scores and curves of weight changes are given for groups of from 9 to 10 guinea pigs each on a scorbutic diet, with the following treatment: (1) Basal diet alone, (2) basal diet plus 0.7 cc of orange juice daily, and (3) basal diet with 1 cc of cortin (injected). The other two groups consisted of guinea pigs from which one adrenal had been removed one week previous to the experimental period. One of these (4) received the basal diet alone and the other (5) with 0.7 cc of orange juice.

The lowest average scurvy score was that of group 5, followed in increasing order by scurvy score and loss of weight by group 2, groups 3 and 4, and the control group 1. Inasmuch as the removal of one adrenal is followed by hypertrophy of the remaining adrenal, with possible overcompensation in the production of cortin, the results are thought to point to the possibility that the adrenal cortex through cortin aids in the utilization of vitamin C. The question as to the possible presence of hexuronic acid (vitamin C) in cortin is thought to be answered in the negative by the fact that ether in which hexuronic acid is insoluble was used for the extraction.

The problem of dental caries, T. ROSEBURY (*Arch. Path.*, 15 (1933), No. 2, pp. 260-278).—This review of recent literature is presented under the headings clinical and pathologic aspects, etiology, the systemic approach, the local approach, and the bacteriology of dental caries. Concerning the relation of diet, the author states that "some factor concerned with the character of the diet is of importance in susceptibility to caries. The incidence of caries in children may be reduced by regulation of the diet, and typical caries may be produced in rats by dietary means. It now appears likely that this dietary factor is physical rather than chemical, acting locally in the mouth rather than through the agency of a dietary deficiency, but such deficiency may contribute to the process. The possible relationship to susceptibility to caries of other factors of a systemic or metabolic nature, and of factors influencing the structure of the teeth, cannot be excluded, but may be doubted pending the accumulation of additional evidence."

Numerous references to the literature are given as footnotes.

Failure to produce dental caries with high carbohydrate, and with extremely low fat diets, C. A. LILLY and J. D. GRACE (*Soc. Expt. Biol. and Med. Proc.*, 30 (1932), No. 2, pp. 176, 177).—The theory that a high carbohydrate diet tends to produce dental caries was tested by feeding three groups of 10 young rats each for a period of 6½ months on diets containing 66 percent of glucose, lactose, and maltose, respectively. At the end of the experiment the teeth, examined under light and magnification, showed no evidence of caries.

The suggestion that a diet extremely low in fat tends to produce caries was likewise tested, with negative results, on two groups of 5 young rats each. These groups were kept for 9 months on diets containing in one case only 5 percent of fat in the form of cod-liver oil and in the other the same quantity of butterfat.

TEXTILES AND CLOTHING

The quantitative chemical estimation of textile fibers, R. EDGAR, M. WESTON, F. BARR, E. FISHER, and J. ROSS (*Iowa State Col. Jour. Sci.*, 7 (1933), No. 2, pp. 57-91, pl. 1).—The work recorded in this contribution from the Iowa

Experiment Station dealt with five main subjects: The quantitative estimation of cotton cellulose in the presence of wool, silk, regenerated cellulose rayon, or cellulose acetate rayon; the quantitative estimation of regenerated cellulose in the presence of cotton cellulose, wool, silk, or cellulose acetate rayon; the quantitative estimation of silk in the presence of regenerated cellulose or cellulose acetate rayon; the quantitative estimation of wool in the presence of cotton cellulose, silk, regenerated cellulose, or cellulose acetate rayon; and the quantitative estimation of cellulose acetate rayon in the presence of wool, silk, or cellulose.

Both half-saturated chromic acid solution and Schweizer reagent were shown to be unsatisfactory for the quantitative separation of regenerated cellulose from cotton cellulose. Silk fibroin failed to dissolve completely in ammoniacal nickel hydroxide prepared in accordance with the previously recorded procedures, but 1 g of silk dissolved completely in 5 minutes at the boiling point in 70 cc of ammoniacal nickel hydroxide reagent "prepared by using 425 cc of aqua ammonia, sp. gr. 0.90, for a volume of 500 cc." Even with this improvement, however, "ammoniacal nickel hydroxide has been shown to be an unsatisfactory solvent for silk in the quantitative analysis of mixtures because the undissolved nickel hydroxide deposits on the fibrous residue and is extremely difficult of removal." Numerous other solvents and two hydrolytic methods were also investigated.

Under the second main heading are summarized the effects of dilute sodium hydroxide solutions, Fehling solution, alkaline copper glycerol, and acetone on the weight of viscose rayon, determined under the conditions in which these solvents are employed in the quantitative separation of textile mixtures.

In the third group of experiments it was shown that cellulose acetate rayon may be separated quantitatively from mixtures with silk by solution in acetone. Neither 70 percent acetic acid nor aniline were found satisfactory for the quantitative separation of cellulose acetate rayon from silk, and for the quantitative separation of regenerated cellulose from silk the hydrolytic method using hydrochloric acid, sp. gr. 1.05, is preferable to that employing sulfuric acid, sp. gr. 1.345.

"The use of sulfuric acid, sp. gr. 1.524, for 20 minutes at 25° C. has been shown unsatisfactory as a differential solvent for cotton or regenerated cellulose in the quantitative estimation of wool. The use of sulfuric acid, sp. gr. 1.345, for 24 hours at room temperature has been shown unsatisfactory as a differential solvent for cotton or regenerated cellulose in the quantitative estimation of wool. The effect on the weight of wool keratin is reported for acetone, alkaline copper glycerol, basic zinc chloride, calcium thiocyanate, calcium thiocynate and calcium chloride, hydrochloric acid, sp. gr. 1.19, hydrochloric acid, sp. gr. 1.05, Schweizer reagent, and sulfuric acid, sp. gr. 1.345."

The use of acetone as a differential solvent for the cellulose acetates (other than the triacetate) of union textiles gave the best results and is the only method which may be used with all union textiles. "The results obtained by the method of direct solution are about the same (mean error of +0.20 percent) as those based on the weight of the residue; however, the indirect method is preferable because it is more rapid and is simpler of manipulation. Acetic acid has been shown unsatisfactory as a differential solvent in the direct estimation of the cellulose acetate of union textiles. The proximate analysis of a union textile for cellulose acetate by means of the determination of the acetyl value by the method of acid hydrolysis has been shown unsatisfactory.

"The use of 1:1 alcohol-water as a swelling medium and 0.5 N alcoholic sodium hydroxide as a saponifying agent has been shown the best (mean

error of +1.52 percent ester) of all the methods of alkaline hydrolysis for the acetyl value of cellulose acetate rayon in cotton mixtures. The cellulose acetate rayon studied (of usual acetyl content as compared with 15, 18, 24, 26, 47, 84, 97, 105, and 126) yielded acetyl values of 37.67, 37.76, and 37.92 (the theoretical acetyl value for cellulose diacetate is 34.96), respectively, by the Ost, Barnett, and Eberstadt methods."

HOME MANAGEMENT AND EQUIPMENT

The use of time by rural homemakers in Montana, J. E. RICHARDSON (*Montana Sta. Bul.* 271 (1933), pp. 28, fig. 1).—This study is similar to previous ones from Nebraska (E.S.R., 61, p. 196), Oregon (E.S.R., 62, p. 496), Rhode Island and Washington (E.S.R., 62, p. 598), and South Dakota (E.S.R., 63, p. 797). A total of 48 records for 7 consecutive days was secured in the fall months and 44 in the spring. Records were kept in both fall and spring by 26 homemakers.

The distribution of time followed a similar pattern to that in the other studies reported. Work of all kinds occupied an average of 62 hours 20 minutes in the fall and 65 hours 10 minutes in the spring, sleep 59 hours 50 minutes and 60 hours 35 minutes, and personal care and recreation 45 hours 50 minutes and 42 hours 15 minutes, respectively. Further analyses of the records are reported for the distribution of time among the different kinds of work and personal care and recreation, with a discussion of factors that may have affected the use of time.

Food purchasing for the home, R. D. BLINKS and W. MOORE (*Chicago: J. B. Lippincott Co.*, 1932, 2. ed., rev., pp. XIV+434, [pls. 3], figs. [49]).—This is a revised edition of the text previously noted (E.S.R., 63, p. 88).

Electrical cookery, L. SMITH, M. M. MONROE, and P. S. GREENE (*Maine Sta. Bul.* 363 (1932), pp. 271-274).—This report includes a summary and discussion of records obtained from farm bureau and federated club women of the State in a survey of cooking practices, and of laboratory studies of heating equipment, utensils, and management problems involved in electric cookery.

MISCELLANEOUS

Summary report of progress [of Maine Station] for the fiscal year ending June 30, 1932, F. GRIFFEE (*Maine Sta. Bul.* 363 (1932), pp. I-III+233-308, pl. 1, figs. 21).—This bulletin contains, in addition to data not previously reported or noted elsewhere in this issue, a brief tribute to the late W. H. Jordan, by J. M. Bartlett (pp. I-III), and meteorological observations (pp. 304-306).

Agricultural research in New Hampshire: Annual report of the director of the New Hampshire Agricultural Experiment Station for the year 1932, J. C. KENDALL (*New Hampshire Sta. Bul.* 270 (1933), pp. 27).—The experimental work not previously noted is for the most part abstracted elsewhere in this issue.

[Recent accomplishments of the Oregon Station and substations] (*Oregon Sta. [Pamphlet, 1933], pp. 12, figs. 2; Branch Sta. [Pamphlets, 1933]—Harney Sta., pp. 8, figs. 3; Hood River Sta., pp. 10, figs. 4; John Jacob Astor Sta., pp. 8, figs. 5; Pendleton Field Sta., pp. 8, figs. 5; Sherman Sta., pp. 8, figs. 3; Southern Oregon Sta., pp. 8, figs. 4; Umatilla Sta., pp. [8], figs. 4; Oregon Livestock Sta., pp. 8, figs. 4).—The experimental work reported in these folders not previously referred to is for the most part noted elsewhere in this issue. Meteorological data are also included in the reports of the Harney (Burns), Hood River, Pendleton, Sherman (Moro), Southern Oregon (Talent), Umatilla (Hermiston), and State Livestock (Union) Substations.*

NOTES

California University and Station.—H. R. Tolley, professor of agricultural economics and agricultural economist and director of the Giannini Foundation, has been appointed chief of the section of special crops in the U.S.D.A. Agricultural Adjustment Administration. In this capacity he will organize the relief program for crops not listed as basic commodities under the act, a program centering largely around marketing agreements.

Colorado College and Station.—Dr. C. P. Gillette, for 43 years head of the department of entomology and director of the station from 1910 to 1932, terminated active connection with the college and station July 1, but it is expected that he will continue his research activities.

A. M. Binkley, associate professor of horticulture and associate horticulturist, has been appointed acting head of the department, with Dean and Director E. P. Sandsten retaining the position of professor of horticulture and State horticulturist. Albert F. Hoffman, formerly county agent at Cripple Creek, has been appointed assistant in horticulture in charge of the Mountain Vegetable Substation at Avon.

The work of the station section of bacteriology has been combined with the bacteriological work of the college and with Dr. I. E. Newsom, professor of veterinary pathology and veterinary pathologist, in charge.

Iowa College and Station.—Under a recent reorganization of activities, H. H. Kildee, head of the department of animal husbandry and vice dean of the division of agriculture, has been appointed dean of agriculture; M. D. Helser, head of the meat subsection of the station, as dean of the junior college; and Dr. R. E. Buchanan, head of the department of bacteriology and dean of the graduate school, as director of the station. President R. M. Hughes is for the present continuing as acting director of the division of agriculture, with George Godfrey as assistant.

Nevada Station.—The station chemist and the department of farm development are making an investigation in the lower part of the Lovelock Valley with the object in view of determining the permanency of the agriculture under the method of irrigation now being used there. In that part of the valley irrigation water is limited to such an extent that crops must usually be grown with two, occasionally three, light irrigations applied in such a way that very little is lost by seepage. The question is, How long will it take to add sufficient alkali salts to reduce crop production seriously, assuming that the salts added in the irrigation water are not removed? This investigation has been requested by residents of the irrigation district because of a refusal of loans by the Federal Land Bank on the ground that the constant accumulation of alkali salts might reduce the productivity and value of the land within the time limits of the loan.

The department of farm development is attempting to produce matured, well developed turkeys of lighter weight than those normally sold on the market. This project is in response to a demand for smaller sized birds based on the small size of present-day city families and of modern gas and electric ovens. In the first experiments the effect of varying the percentage of protein in the ration from 13 to 28 percent on the development of pinfeathers and on earliness of maturity will be determined. Later studies will deal with the effects of fats in the ration.

New Mexico College and Station.—Luther Foster, associated with the development of college and station work in the Rocky Mountain area from 1885 to his retirement in 1921, died at Las Cruces June 17 at the age of 84 years. He was a native of Iowa and one of the few remaining Civil War veterans in New Mexico. He was a member of the first graduating class at the Iowa College, that of 1872, and also received the M.S.A. degree from the same institution in 1888.

Among other positions, Prof. Foster had been professor of agriculture in the South Dakota College from 1885 to 1890 and director of the South Dakota Station from 1890 to 1893; professor of agriculture and botany in the Montana College from 1893 to 1896; professor of agriculture and director in the Utah College and Station from 1897 to 1900; and professor of agriculture and horticulture and director in the Wyoming University and Station from 1900 to 1901. In New Mexico he served as president and director from 1901 to 1908, as dean of the college and director of the station from 1908 to 1913, and as animal husbandman from 1913 to 1921.

Practically all of his work was carried on under pioneer conditions. Thus for New Mexico his final report as director states that when he assumed his duties there in 1901 the station organization included four departments, "with a working force of seven men, who in addition to their station duties gave instruction to all college classes pursuing their special lines of work." Under his direction considerable reorganization gradually took place, special prominence being given to irrigation and dry farming studies and to a rather wide range of problems of immediate importance to the large percentage of farmers new to New Mexico conditions. As he puts it, "a definite settled policy of station management, the reduction of much scattered, indefinite work to a few important lines, the energy with which the work was carried out, the coming in closer touch with the farmers of the State, and the better appreciation of the work by them, taken with the increased appropriation, are responsible for the substantial progress and constant development the station has made during the past 12 years." This modest statement, however, fails to give adequate credit to his substantial personal contribution there and elsewhere of wise and able management under conditions of special difficulty.

New York State Station.—A recent official decree of the Japanese Government has established the so-called Breed method devised at the station for the direct counting of bacteria in milk, cream, and other dairy products as the approved method for the control of the sanitary quality of the market milk supply of Japan. A Japanese version of the directions for using the method has been prepared, and about 500 milk inspectors in Japan have been trained in its use. A recent survey of public health and milk plant laboratories by the committee on standard methods of milk analysis of the American Public Health Association has revealed that in the United States considerably more than a million samples of milk are examined annually by the method.

A rock garden, including a large collection of native wild flowers, is under construction.

Pennsylvania College and Station.—Effective July 1 the Institute of Animal Nutrition of the college, which heretofore has been a separate division cooperating with but not responsible administratively to the School of Agriculture and station, has been given the status of a department of the School of Agriculture and station.

Dr. F. F. Lininger, professor of agricultural economics and agricultural economist, has been granted leave of absence from August 7 to February 7, 1934, and from June 1 to 30, 1934, for the purpose of participating in a study

of the administration of the Agricultural Adjustment Act to be made by the Brookings Institution of Washington, D.C.

Clemson College and South Carolina Station.—Under a reorganization program recently approved by the board of trustees, H. W. Barre, who has been director of the station for 16 years, has also been appointed dean of the School of Agriculture. This linking together of teaching and research is expected to bring about a more effective utilization of the personnel and financial resources of the institution. G. H. Aull, for 12 years assistant director of research, has been appointed agricultural economist and assistant director of the station. He will head the joint research and teaching department of agricultural economics, but will continue to assist in the general administration of the station.

Virginia College and Station.—D. R. Forrester, assistant animal husbandman, resigned June 30. E. L. Wood and M. L. Bobb have been appointed assistants in entomology. The doctor of philosophy degree was conferred in June by the University of Virginia on Dr. L. E. Starr, assistant professor of zoology and animal pathology and assistant animal pathologist; by the University of Rochester on A. D. Pratt, assistant professor of dairy husbandry and assistant dairy husbandman; and by the University of West Virginia on A. B. Groves, assistant plant pathologist.

In the department of agricultural economics and rural sociology, Dr. W. E. Garnett, professor of rural sociology and rural sociologist, and A. C. Seymour, assistant rural sociologist, have been assigned full time to station work, and B. L. Hummel, rural sociologist, full time to extension. J. M. Ellison, field assistant in rural sociology, who has been on leave for graduate study at Drew University, resumed his duties at the station June 10.

West Virginia University and Station.—Under a new plan adopted by the board of governors, reorganization of the divisions of the College of Agriculture under a single administrative head is announced. All resident teaching of agricultural students, farm research, and extension work will be coordinated under the direction of Dr. F. D. Fromme, dean of the college and director of the station, who now also becomes director of the extension division. J. O. Knapp, district county agent for the southern counties, has been appointed assistant director of extension; Russell H. Gist, district agent for the northern counties, State leader of county agents; and C. H. Hartley, formerly assistant director of extension, State leader of boys' and girls' club work. Offices of all these officials will be maintained in Morgantown. It is hoped by this new set-up so to reduce the costs of administration of the extension program that a larger portion of the funds may be devoted to the work in the counties, while the work of the college will become more closely knit with the research and extension program of the university.

Reorganization in the field of biology has also been undertaken. Where formerly the various branches of this subject were distributed among several colleges of the university, most phases are now being coordinated under a single directing head and combined into one division of the College of Agriculture. Dr. C. R. Orton, formerly head of the department of plant pathology, has been given charge of the new department, which embraces all basic sciences related to biology, including botany, zoology, bacteriology, plant diseases, and forestry extension. In addition the research in plant diseases carried on by the station continues under Dr. Orton's direction. The change is expected to result in a broadening of service which the new department can offer along biological lines, including the training of graduate students.

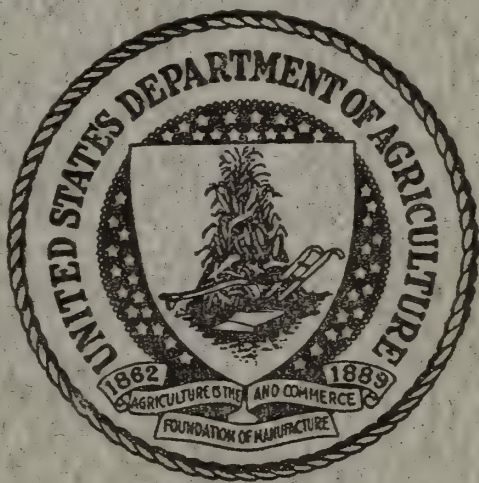
UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS

Vol. 69

OCTOBER 1933

No. 4

EXPERIMENT STATION RECORD



By direction of the Secretary of Agriculture, the matter contained herein
is published as administrative information required for the
proper transaction of the public business

For sale by the Superintendent of Documents, Washington, D.C. ----- Price 15 cents
Subscription per volume (2 volumes a year) consisting of 6 monthly numbers and index, \$1.00
Foreign subscription per volume, \$1.50

EXPERIMENT STATION RECORD

Editor: HOWARD LAWTON KNIGHT

EDITORIAL DEPARTMENTS

Agricultural and Biological Chemistry—H. C. WATERMAN, SYBIL L. SMITH.
Agricultural Meteorology—W. H. BEAL.
Soils and Fertilizers—H. C. WATERMAN.
Agricultural Botany, Diseases of Plants—W. E. BOYD,¹ J. W. WELLINGTON,
H. M. STEECE, F. V. RAND.
Genetics—H. M. STEECE, J. W. WELLINGTON, G. HAINES.
Field Crops—H. M. STEECE.
Horticulture and Forestry—J. W. WELLINGTON.
Economic Zoology and Entomology, Veterinary Medicine—W. A. HOOKER.
Animal Husbandry, Dairying, and Dairy Farming—H. W. MABSTON.
Agricultural Engineering—R. W. TRULLINGER.
Agricultural Economics—F. G. HARDEN, B. YOUNGBLOOD.
Rural Sociology—B. YOUNGBLOOD, F. G. HARDEN.
Agricultural and Home Economics Education—F. G. HARDEN.
Foods and Human Nutrition—SYBIL L. SMITH.
Textiles and Clothing—H. M. STEECE, SYBIL L. SMITH.
Home Management and Equipment—
Indexes—MARTHA C. GUNDLACH.
Bibliographies.—CORA L. FELDKAMP.

¹ Died Aug. 25, 1933.

CONTENTS OF VOL. 69, NO. 4

Editorial:	Page
A handbook of the agricultural experiment stations in temperate countries.....	481
Recent work in agricultural science.....	483
Agricultural and biological chemistry.....	483
Agricultural meteorology.....	494
Soils—fertilizers.....	495
Agricultural botany.....	504
Genetics.....	507
Field crops.....	512
Horticulture.....	520
Forestry.....	525
Disease of plants.....	526
Economic zoology—entomology.....	543
Animal production.....	562
Dairy farming—dairying.....	572
Veterinary medicine.....	577
Agricultural engineering.....	596
Agricultural economics.....	600
Rural sociology.....	612
Foods—human nutrition.....	615
Textiles and clothing.....	620
Home management and equipment.....	621
Miscellaneous.....	621
Notes.....	622

EXPERIMENT STATION RECORD

VOL. 69

OCTOBER 1933

No. 4

EDITORIAL

A HANDBOOK OF THE AGRICULTURAL EXPERIMENT STATIONS IN TEMPERATE COUNTRIES

The International Institute of Agriculture at Roma has undertaken a much needed service in its compilation of a handbook entitled *Les Institutions d'Expérimentation Agricole dans les Pays Tempérés*, bibliographical details regarding which are noted on page 621. This handbook supplements *Stations Expérimentales et autres Institutions Officielles ou Privées s'occupant du Développement et de l'Amélioration de l'Agriculture dans les Pays Chauds*, published in 1931 (E.S.R., 66, p. 88), as well as the Institute's series of publications on educational and research institutions concerned with special subjects, such as agricultural engineering and zootechny.

The aim in this work has been to cover through these various publications the organized agricultural research of the world. This is obviously an ambitious venture, and one which had not been seriously attempted since the revision in 1904 of Bulletin 112 of the Office of Experiment Stations, entitled *Agricultural Experiment Stations in Foreign Countries*. The period of more than a quarter century which has elapsed since that publication was issued has been one of unprecedented development of agricultural experimentation, and despite the inevitable set-backs incident to the World War and the prevailing world-wide depression, active participation in agricultural research has become the accepted governmental policy in every civilized country of the globe.

The restriction of the Institute's latest volume to the temperate regions has eliminated from its pages all reference to Africa, Central America and the immediately adjoining territories, much of Australia, South America aside from Argentina, and most of Asia except China and Japan. Yet a book of about 300 pages remains, and mention is made of fully 1,300 institutions.

The arrangement of the material is by continents and countries. About 175 pages are devoted to Europe, and North America (Canada and the United States) receives over 50 pages. For each country a brief statement is given as to the general plan of organization of its agricultural research, and this is followed by accounts of individual institutions which take up such matters as their location and date of establishment, the amount and sources of revenues, the acreage and nature of the soil, the number and character of their personnel, their plan of work and accomplishments, and their publications and

other methods of disseminating results. The language used in the handbook is French, but in many cases the official title of each institution is repeated in its original form.

The basis of information was an institutional questionnaire, and where this was fully attended to the data are correspondingly complete and authoritative. Unfortunately, not all institutions responded, and as a result there are gaps which are sometimes disconcerting. The situation in Canada, for example, is very completely depicted as regards the Central Experimental Farm at Ottawa and the 22 stations and farms associated with it, but of the work affiliated with the colleges of agriculture there is mentioned only that in Ontario and Nova Scotia, no reference being made to that of Macdonald College and the Oka Agricultural Institute in Quebec nor that of the Universities of Alberta, British Columbia, Manitoba, and Saskatchewan. Somewhat the same situation prevails as regards certain other countries, and for a number (among them China, Japan, and the Union of Soviet Socialist Republics) lists without further details are all that is provided.

For the United States a clear interpretation is given of the system of State experiment stations, and although there are some variations in treatment, for practically all of the individual stations the data supplied are reasonably complete and comparable. Little account has been taken, however, of the research work of the Federal Department of Agriculture, either in Washington or elsewhere, and no mention is made of its many important field stations, such as the Northern Great Plains Station at Mandan, N.Dak., the livestock station at Jeanerette, La., or the range experiment station of nearly 57,000 acres at Miles City, Mont.

Notwithstanding these and other rather serious omissions, the handbook should prove very useful. The experiment stations in the United States, for example, should find it a valuable source of additional information as to many of the entries in the selected list of agricultural research institutions and library centers in foreign countries recently prepared independently by this Office with somewhat different objectives. Much of this information has not hitherto been available, and it should be of great service in facilitating decisions as to exchange relationships and similar matters. The Institute is to be congratulated for its initiative and persistence in collecting and assembling the large amount of data which the handbook contains. Not only should this information be very helpful to the Institute itself as a major step toward what it is hoped will ultimately become "a complete and up-to-date inventory of the agricultural institutions of the world", but by enlightening these institutions as to each others' work and facilities it should promote closer contacts and more effective utilization of their resources.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Transference and conductivity studies on solutions of certain proteins and amino acids with special reference to the formation of complex ions between the alkaline earth elements and certain proteins, S. MIYAMOTO and C. L. A. SCHMIDT (*Jour. Biol. Chem.*, 99 (1933), No. 2, pp. 335-358, figs. 12).—The data obtained in the experiments recorded indicate that within the limits of accuracy of the transference experiments, the sodium salts of casein, dephosphorized casein, aspartic acid, and glutamic acid, and the calcium and barium salts of the two last-mentioned amino acids do not yield complex ions; whereas, solutions of the calcium salts of casein and dephosphorized casein yield complex ions in solution. It was shown also that the number of complex ions in solutions of the calcium salt of dephosphorized casein is about 10 percent less than in solutions of calcium caseinate. It is concluded that the phosphoric acid in casein is responsible to the extent of about 10 percent for the complex ions in solutions of calcium caseinate. The hypothesis that solutions of casein in the hydroxides of the alkaline earth elements yield complex ions due to step dissociation is advanced.

Attempts to apply Ostwald's dilution law to solutions of aspartic acid, glutamic acid, and glycine indicated that these amino acids tend to obey the dilution law only in extremely high dilutions.

Sulfur in proteins.—V, The effect of alkalies upon cystine, with special reference to the action of sodium hydroxide, C. J. B. THOR and R. A. GORTNER (*Jour. Biol. Chem.*, 99 (1933), No. 2, pp. 383-403).—Continuing a serial contribution (*E.S.R.*, 63, p. 501) from the Minnesota Experiment Station, the authors report a study of the decomposition of *l*-cystine by aqueous potassium, sodium, and barium hydroxides, special attention having been given to the mechanism of the sodium hydroxide reaction.

All the alkaline mixtures which were studied removed nitrogen from the cystine molecule at very nearly the same rate as sulfur. Practically all of the nitrogen remaining in solution after the decomposition of cystine by alkalies was in a form determined by the Van Slyke method for α -amino nitrogen. Cystine was found to be definitely more stable toward boiling 4 *N* NaOH than is cystine. Increasing concentrations of NaOH caused decreasing cystine destruction as measured by residual nitrogen, sulfur, and cystine. The fall in optical activity of *l*-cystine in alkaline solutions was found considerably more rapid than the decomposition of cystine. As regards nitrogen and sulfur elimination and cystine destruction, 4 *N* NaOH and 4 *N* KOH acted on cystine to practically the same extent. Further, "the small extent of deamination of cystine by NaOH and KOH which has been reported by several workers is due to an actual stability of the cystine and not to the formation of peculiar products under these conditions. This has been proved both by analysis and by the isolation of the crystalline cystine in 40 percent yield from cystine which had been boiled for 12 hours in 4 *M* NaOH solution.

"The relatively great stability of cystine toward NaOH (and presumably also KOH) appears to be the result of a secondary reaction between some decomposition product and undecomposed cystine leading to stabilization of the latter. This is indicated by the type of reaction curves obtained and by the fact that the isolated residual cystine was found to decompose in exactly the same manner as the original *l*-cystine. Such a stabilization hypothesis is presented.

"It is probable that the ether- and alcohol-soluble fraction, obtained by Gortner and Sinclair [E.S.R., 63, p. 501] by boiling cystine for 24 hours with saturated Ba(OH)₂, consisted of cysteine mixed with nonnitrogenous products, since a sample after standing for somewhat over a year had changed markedly in physical properties and was found to contain a fair proportion of *i*-cystine."

Preparation and study of the cereal glutelins (*Nebraska Sta. Rpt.* [1932], pp. 26, 27).—Experimental findings are briefly presented.

β -amino-*n*-valeric acid, H. D. DAKIN (*Jour. Biol. Chem.*, 99 (1933), No. 2, pp. 531–535).—The new amino acid was formed by the action of ammonia under pressure on propylideneacetic acid, which, in turn, was prepared by treating the ethyl ester of α -bromo-*n*-valeric acid with quinoline. The melting point was not sharp, decomposition beginning between 160° and 165° C., whereas the compound did not melt clear below 185°. The copper salt, the phosphotungstate, the reineckate, and the formation of β -uramido-*n*-valeric acid, 4-ethylhydrouracil, and 1-phenyl-4-ethylhydrouracil are described.

Cuprous glutathione, N. W. PIRIE (*Biochem. Jour.*, 26 (1932), No. 1, pp. 75–79, fig. 1).—Modifications of detail in the preparation of glutathione from yeast cells are noted, together with a procedure for the preparation of the cuprous salt of glutathione. The crystallographic constants of glutathione are given, as are also the optical rotation (+45.4 to +45.8 as for the mercury green line at 16.5° C.) of cuprous glutathione. Finally, "evidence is brought forward to show that there is no reason to assume the existence of a cuprous derivative of oxidized glutathione, insoluble in weak acids."

The nature of plastein, S. J. FOLLEY (*Biochem. Jour.*, 26 (1932), No. 1, pp. 99–105, figs. 2).—"The evidence in favor of the view that plastein is a synthetic product is regarded as inconclusive.

"The molecular weight of plastein was found by the ultracentrifugal method to be 1,000 or less. A determination of the nitrogen distribution of plastein shows that this substance contains less amide-N and more monoamino-acid-N than egg albumin, the protein from which it was derived. The significance of these differences is unknown. The phenyl isocyanate derivative of plastein has been shown to consist of at least two fractions with equivalent weights of the same order as that of proteose. Plastein thus appears to consist of a mixture of substances."

On the purification and constitution of theelol, D. W. MACCORQUODALE, S. A. THAYER, and E. A. DOISY (*Jour. Biol. Chem.*, 99 (1933), No. 2, pp. 327–334).—Continuing their earlier work on this group of hormones (E.S.R., 64, p. 710), the authors describe an improved method for the purification of theelol based on the insolubility of the alkali metal salts in solutions of hydroxides of these metals. Prolonged treatment of theelol with strong alkali did not alter its physiological activity, optical rotation, or melting point.

Treatment with ketone reagents failed to reveal the presence of any theelin in routine preparations of purified theelol. Alkali fusion of theelol resulted in the formation of a phenolic dibasic acid, C₁₈H₂₂O₅. The methyl ether of this acid on treatment with acetic anhydride and distillation in a vacuum yielded an acid anhydride, C₁₉H₂₂O₄. No ketone was formed. "The most probable conclusion to be drawn from these facts is that the theelol molecule contains a

5-membered carbon ring bearing two secondary hydroxyl groups on adjacent carbon atoms." Catalytic reduction of theelol by means of a nickel catalyst yielded a hexahydro derivative insoluble in alkali. Desoxotheelin was prepared by the Clemmensen reduction of theelin and found to have the formula, $C_{18}H_{24}O$. This substance proved slightly soluble in dilute aqueous alkali.

An extension and a limitation of the thiocyanate method for the preparation of 2-thiohydantoins, B. H. NICOLET (*Jour. Biol. Chem.*, 99 (1933), No. 2, pp. 429-433).—In a contribution from the U.S.D.A. Bureau of Dairy Industry the author describes the preparation of 1-acetyl-2-thio-5-methyl-5-acetylaminohydantoin, 2-thio-5-methyl-5-acetylaminohydantoin, 1-benzoyl-2-thio-5-benzoylaminomethylhydantoin, and 2-thio-5-benzoylaminomethylhydantoin; and explains the failure of the reaction in certain instances as more likely to be due to "a stabilization of the azlactone ring to such an extent that addition of HNCS no longer takes place," than to an abnormal azlactone structure arising from some unknown cause.

Some properties of the enzyme glyoxalase, J. O. GIRŠAVIČIUS (*Biochem. Jour.*, 26 (1932), No. 1, pp. 155-161, figs. 3).—A method for estimating active mandelic acid in tissue extracts by extracting the acid with amyl alcohol and increasing the optical rotation by the addition of uranyl nitrate enabled the author to determine the effect of toluene and of various buffer substances on the activity of glyoxalase, together with the pH activity curve of the enzyme. Borate buffer mixtures appeared to have little effect upon the action of the enzyme, whereas phosphate buffers had a marked inhibitive influence and diethyl barbiturate buffers a strong inhibitive effect.

Milk peroxidase: Its preparation, properties, and action with H_2O_2 on metabolites, with a method for determining small amounts of H_2O_2 in complex mixtures, K. A. C. ELLIOTT (*Biochem. Jour.*, 26 (1932), No. 1, pp. 10-24).—"A crude, but considerably concentrated preparation" of milk peroxidase, "practically free from catalase" was obtained by means of an ammonium sulfate fractional precipitation method of which the working detail is given. The activity of this preparation was found to degenerate very slowly at temperatures of from 0° to 5° C., and the enzyme was active through a pH range of from about pH 4 almost to pH 10. A color appeared to be associated with the enzyme, and hemochromogen bands were observed. Such hydrosulphy compounds as cysteine, glutathione, and denatured proteins interfered with tests for peroxidase with benzidine, guaiacum, and to some extent also with those made with *p*-phenylenediamine. This appeared not to be an inhibition of the enzyme, as with hydrogen sulfide. It seemed rather to be due to the reduction of the colored reaction products by hydrosulphy compounds.

A method of estimating hydrogen peroxide in very small amounts (1 mg in 35 cc) by measuring the evolution of molecular oxygen by manganese dioxide is described. "The volume of gas obtained is affected by the presence of proteins, phosphate, acid, etc., but in given conditions it is proportional to the hydrogen peroxide initially present." Conditions under which nitrate could be quantitatively oxidized by hydrogen peroxide with peroxidase, as shown by the consumption of the hydrogen peroxide and the disappearance of nitrite, are also specified. Under similar conditions tyrosine and tryptophan were found to be oxidized to colored products.

"Under the conditions in which nitrite is quantitatively oxidized, no oxidation by hydrogen peroxide and peroxidase of the following substances was obtained: Formate, acetate, oleate, stearate, triolein, ethyl alcohol, glucose, glycerol, acetaldehyde, β -hydroxybutyrate, lactate, glycine, phenylalanine, histidine. Dihydroxyacetone and phenylglyoxal are oxidized by very dilute hydrogen peroxide without peroxidase."

Iron in relation to tyrosinase, C. E. M. PUGH (*Biochem. Jour.*, 26 (1932), No. 1, pp. 106-117).—Determinations of the iron content of tyrosinase preparations were considered inconclusive with reference to the question as to the presence of iron in the molecule of the enzyme itself. The coloration of solutions of tyrosine and of paracresol by tyrosinase was shown to be accelerated by the presence of small quantities of various salts, however; an observation which "provides indirect evidence that hydrogen peroxide is produced during the action of tyrosinase." It was further observed that "the oxidation of monohydric to *o*-dihydric phenols by hydrogen peroxide with ferrous salt is less specific than the action of tyrosinase, and provides only a very imperfect imitation of the action of tyrosinase. . . . The loss in activity of tyrosinase from mealworms on dialysis may be prevented by carrying out the dialysis into alkaline buffer solution, and is therefore not due to loss of iron or other specific salts."

Growth of *Aspergillus versicolor* on higher paraffins, S. J. HOPKINS and A. C. CHIBNALL (*Biochem. Jour.*, 26 (1932), No. 1, pp. 133-142).—A mold form "best described at the present time as a strain of *A. versicolor* (Buillemain) Tiraboschi" was found capable of utilizing solid paraffins, both of odd and of even number of carbon atoms, up to $C_{34}H_{70}$ but not $C_{35}H_{72}$, the determinable products of metabolism in the case of the large scale culture on the heptacosane, or $C_{27}H_{56}$, preparation being only carbon dioxide and the mold mycelium. "Indirect evidence has, however, been obtained from experiments with higher ketones on which the mold grew vigorously, and with secondary alcohols on which no growth was obtained at all. It appears that the primary product of oxidation of a paraffin is a ketone or polyketone, and that further oxidation results in the production of shorter fatty acids which are then metabolized in the usual way."

Characteristics of oxidation by *Azotobacter*, H. LINEWEAVER (*Jour. Biol. Chem.*, 99 (1933), No. 2, pp. 575-593, figs. 6).—The author of this contribution from the U.S.D.A. Bureau of Chemistry and Soils reports *A. vinelandii* as capable of oxidizing, by means of molecular oxygen, a large number of compounds including glucose, lactate, pyruvate, succinate, acetate, malonate, malate, tartrate, fumarate, ethyl, propyl, and butyl alcohols, formaldehyde, and *l*-tyrosine. "It does not appreciably oxidize formate, acetaldehyde, glycollate, oxalate, cystine, or *l*-cysteine; *l*-leucine is oxidized only very slowly if at all. Maleate, a stereoisomer of fumarate, is not oxidized. The formation of intermediate compounds has been specifically demonstrated in the cases of malonate and ethyl alcohol, the intermediate being acetic acid in both cases. In general, if a substrate is oxidized at all, it is oxidized practically entirely (at least 95 to 100 percent) to CO_2 and water."

"The presence of a malonate carboxylase enzyme has been demonstrated. The presence of typical dehydrogenases has been demonstrated by the methylene blue technic and certain narcotics."

"The velocity of oxidation of many substrates increases at first, over a period of several hours, before finally attaining a more or less constant value. Either intermediate compound formation or enzyme formation may be involved. The velocity of oxidation with mixed substrates is in general not additive. The Q_{O_2} values for the various substrates oxidized was very high compared to that for other organisms. The maximum value for many substrates under ideal conditions varies from 1,000 to 4,000."

"The effect of HCN and H_2S indicated heavy metal catalysis of respiration. The Hecht-Eicholtz reagents suggest but do not prove that Cu is involved." The 50 percent inhibition concentrations for the alcohol, urethane, and urea

homologous series are reported. The inhibition was not found to be a function of age, and in the case of propyl and butyl alcohols was found reversible.

Bacterial metabolism.—I, Lactic acid production by haemolytic streptococci, L. F. HEWITT (*Biochem. Jour.*, 26 (1932), No. 1, pp. 208-217).—In a salt solution buffered with bicarbonate and containing glucose and 10 percent of meat broth (in which excellent growth of hemolytic streptococci was obtained), "about three quarters of the glucose broken down in hemolytic streptococcus cultures yielded lactic acid, and this proportion remained remarkably constant over a range of cultural conditions, thus indicating a relatively simple fermentation process. Glucose breakdown was much more rapid in matt virulent cultures than with the glossy variants in the case of the strains investigated. Metabolic differentiation of bacterial variants is thus indicated."

The specific carbohydrate of the tubercle bacillus, G. A. C. GOUGH (*Biochem. Jour.*, 26 (1932), No. 1, pp. 248-254).—The isolation of the specific carbohydrate from tubercle bacilli and from the medium on which they have been grown is described. Acetylation of the carbohydrate with acetic anhydride and pyridine yielded a water-insoluble derivative from which the carbohydrate could be regenerated by alkaline hydrolysis without detectable loss of specific precipitating activity. Hydrolysis of the carbohydrate with acids yielded mannose, *d*-arabinose, galactose, and a mixture of acids which partially lost their acidic nature and gave mannose on prolonged hydrolysis. "Evidence of the presence of an acid, possibly glycolic, was obtained, but no glycuronic acid could be detected."

The glyceride fatty acids of forage grasses.—I, Cocksfoot and perennial ryegrass, J. A. B. SMITH and A. C. CHIBNALL (*Biochem. Jour.*, 26 (1932), No. 1, pp. 218-234).—In a somewhat detailed investigation of the glyceride-bound fatty acids of the two grasses named a highly unsaturated condition of the acids taken together and a relatively low proportion of saturated acids were demonstrated.

"The saturated acids are palmitic and stearic acids, together with a small amount of mixed higher acids similar to 'cerotic acid', which may have been derived from wax esters. The presence of α -linolenic acid was proved by bromination and oxidation, and of α -linoleic acid by oxidation. Thiocyanometric analysis suggests the presence of oleic or an isomeric octadecanoic acid, but no confirmatory evidence could be obtained by oxidation experiments.

"The thiocyanometric method of analysis is discussed in some detail, and the conclusion drawn that it may give misleading results in the case of mixed fatty acids containing large amounts of the so-called β -linoleic and β -linolenic acids. The mixed fatty acids from grasses are of this type."

The composition of whites, yolks, and whole eggs broken out by commercial egg-breaking establishments, L. C. MITCHELL, S. ALFEND, and F. J. McNALL (*Jour. Assoc. Off. Agr. Chem.*, 16 (1933), No. 2, pp. 247-255).—The U.S.D.A. Food and Drug Administration presents a tabulation of the analyses of a large number of samples in terms of solids, total nitrogen, and water-soluble nitrogen in the whites, and of solids, fats, phosphoric anhydride, total nitrogen, and water-soluble nitrogen in the yolks, and with these data the source, manufacturer, and the collection date of the samples.

Occurrence of sulfur, organic matter, nitrogen, and water in phosphate rock, W. L. HILL, H. L. MARSHALL, and K. D. JACOB (*Jour. Assoc. Off. Agr. Chem.*, 16 (1933), No. 2, pp. 260-276).—This contribution from the U.S.D.A. Bureau of Chemistry and Soils presents results of determinations of total sulfur, acid-soluble and acid-insoluble sulfate, and acid-soluble and acid-insoluble sulfide in 26 samples of domestic rock phosphate of commercial grade from

various localities, 2 samples of phosphatic limestone, and 2 samples of North African phosphate. Sulfur was found in all samples analyzed.

The organic carbon, as determined by dry combustion of the rock, was used as a standard measure of the amount of organic matter present in the phosphates. In addition, comparative data were obtained by determining organic carbon by dry combustion of the organic material actually separated from the rock, organic matter by a colorimetric control method, and organic matter and water by calculation from the ignition loss. Quantitative data on the several factors which affect the ignition loss are also given. Organic carbon, nitrogen, and total water were determined in 29 samples of natural phosphates from various deposits in the United States and elsewhere. Large-scale separations of the organic material were made on several types of phosphate rock, and the isolated materials were analyzed for carbon, hydrogen, nitrogen, and sulfur.

The adsorption of electrolytes by ash-free charcoal.—VII, A brief survey of the present status of the subject, and evidence that negative adsorption of inorganic bases decreases with length of time of contact of charcoal with solution, E. J. MILLER (*Jour. Phys. Chem.*, 36 (1932), No. 12, pp. 2967–2980, figs. 5; *abs. in Michigan Sta. Quart. Bul.*, 15 (1933), No. 4, pp. 303, 304).—This contribution from the Michigan Experiment Station (E.S.R., 65, p. 412) is continued, with a presentation of data indicating that negative adsorption of alkali decreases with length of time the charcoal is in contact with the solution; that charcoal must be heated at approximately 1000° or above to produce negative adsorption from solutions of sodium hydroxide; that it is practically impossible to remove even a feebly adsorbed acid such as hydrochloric from charcoal by repeated extraction with boiling water; and that adsorbed hydrochloric acid can be quantitatively removed from charcoal by electro dialysis.

“No one theory alone seems capable of explaining satisfactorily all the known facts of adsorption of electrolytes by adsorbent charcoal.”

Micro analytical methods, E. P. CLARK (*Jour. Assoc. Off. Agr. Chm.*, 16 (1933), No. 2, pp. 255–260, figs. 3).—The general advantages of such methods, the development of a suitable balance, and the determinations of carbon and hydrogen, of nitrogen, of the halogens, and of the methoxyl group are discussed. A point emphasized, in addition to that of the entirely satisfactory grade of accuracy of these methods and their applicability to relatively minute quantities of material, is the economy effected by the introduction of micro methods even in routine and control work.

A micro conductance cell, H. L. WHITE (*Jour. Biol. Chem.*, 99 (1933), No. 2, pp. 445–449, fig. 1).—Of the apparatus of which the description and a drawing are given it is noted, in part, that “the only materials with which the liquid under investigation comes into contact are glass and the electrodes. Transfer of the liquid from the containing pipette into the capillary cell is easy, and all possibility of evaporation is avoided. . . . Cleaning the cell and replatinizing the electrodes are simple procedures. The cell can conveniently and safely be immersed in a constant temperature bath. The resistance even with very small amounts of biological fluid is relatively high.” The avoidance of some difficulties of construction noted in the making of certain earlier conductance cells is pointed out.

The determination of colloid osmotic pressures in small quantities of fluid, R. M. HILL (*Jour. Biol. Chem.*, 99 (1933), No. 2, pp. 323–325, fig. 1).—An osmometer of but 0.3 cc capacity is shown. Equilibrium could be attained in from 1.5 to 2.0 hours when the osmotic pressure was not over 100 mm of water. A gum arabic solution giving an average reading of 253 mm reached equilibrium

in 3.6 hours. The results agreed well with those determined in apparatus requiring larger volumes and a longer time for the establishment of equilibrium.

Study on collodion membrane filters, I, II, I. ASHESHOV (*Jour. Bact.*, 25 (1933), No. 4, pp. 323-337, figs. 2; 339-357, figs. 5).—The author prefers collodion filter membranes to bacteriological filters of the porous porcelain type because of the relative freedom of the collodion film from adsorptive tendencies, the greater ease with which, and range within which, the porosity may be varied, the fact that their retention of particles above a given size is due directly to the size of the pores rather than to the intricacy of the channels (as in porcelain filters) through which the filtrate must pass, so that micro-organisms cannot grow through porosities through which they would not flow, etc. It is also noted that "the electro-negative corpuscles, if retained, lie on the surface of the membrane only and not in the pore channels. Collodion filters thus have two great advantages from the technical point of view: (a) The sediment on the membrane can be collected with very little loss, and (b) the filters can be very easily cleaned and thus can recover a great part of their filtering capacity."

The two papers take up in some detail preparation of graduated membranes, collodion sacs, membrane filters, material for use, stock solution of collodion, preparations of membranes, manipulations of the membrane filters, measurement of permeability, influence of ingredients on the properties of membranes, and the use of membrane filters.

Note on the use of sinalbin as an indicator, K. HARRISON (*Biochem. Jour.*, 26 (1932), No. 1, pp. 88, 89).—Sinalbin, a glucoside of *Sinapsis alba*—obtained by first extracting the oils of the ground seed thoroughly with carbon disulfide, then boiling the air-dried oil-free residue (200 g) from 400 g of the ground seed with 500 cc of 95 percent alcohol for 30 minutes, filtering hot, and bringing about the crystallization of the glucoside by chilling the filtrate in ice water—was found to change from colorless at pH 6.2 to an intense yellow at pH 8.4, and to show but small salt and protein errors. With potassium chloride of a concentration below 0.38 N no salt error was observed; in 0.38 N potassium chloride the salt error became +0.02 pH unit; in 0.46 N, +0.06; and in 0.54 N, +0.15. The protein error introduced by a 2 percent casein solution was -0.09, by 2 percent "natural egg white", +0.03, by 4 percent ox blood serum, 0.04. The indicator was found suitable for the titration of weak acids and bases, including ammonia.

Determination of calcium in mineral mixtures, V. W. MELOCHE, L. E. CLIFCORN, and W. B. GRIEM (*Jour. Assoc. Off. Agr. Chem.*, 16 (1933), No. 2, pp. 240-245).—A method dependent for its improved accuracy upon carrying out the initial precipitation of calcium oxalate in a strongly acid solution—a procedure shown to be of importance especially when the sample contains phosphorous compounds—is described and compared with the Official method in a contribution from the University of Wisconsin. The effect of the presence of magnesium and iron as well as that of phosphorus upon the results yielded by the proposed and by the Official method was determined.

Volumetric method for determination of fluorine, H. H. WILLARD and O. B. WINTER (*Indus. and Engin. Chem., Analyt. Ed.*, 5 (1933), No. 1, pp. 7-10; *abs. in Michigan Sta. Quart. Bul.*, 15 (1933), No. 4, p. 303).—A method for titrating soluble fluoride and silico-fluoride solutions with standard thorium nitrate, using a zirconium-alizarin mixture as indicator, is described. A method for the volatilization of fluorine as hydrofluosilicic acid and the titration of the fluorine in the distillate gave theoretical results in the absence of a large amount of gelatinous silica. Materials which could not be decomposed by perchloric acid required to be fused with sodium carbonate before the fluorine could be volatilized as hydrofluosilicic acid. A method for removing the silica

when a sufficient amount is present to interfere with the volatilization of the fluorine is described. Volatilization of fluorine from certain insoluble fluorides, as silicon tetrafluoride, and determination of the fluorine by titration with thorium nitrate was found to give unsatisfactory results in the presence of plant ash, however. A volatilization of the fluorine as hydrofluoboric acid, with subsequent titration of the fluorine in the distillate, was found to give inconsistent results.

Determination of small quantities of benzyl alcohol, J. CALLAWAY, JR., and R. REZNEK (*Jour. Assoc. Off. Agr. Chem.*, 16 (1933), No. 2, pp. 285-289).—A study of the physical properties of benzyl alcohol and of the conditions under which its oxidation to benzoic acid might be used as a means of determining the alcohol is reported in this contribution from the U.S.D.A. Food and Drug Administration, and methods for determining the alcohol (1) from the specific gravity and immersion refractometer readings and (2) by oxidizing the alcohol to benzoic acid, extracting with chloroform, and titrating the isolated acid, are prescribed.

Rapid methods of examining soils, II, III, R. K. SCHOFIELD (*Jour. Agr. Sci. [England]*, 23 (1933), No. 2, pp. 252-260).—These two papers, continuing the general subject of the previous contribution (E.S.R., 68, p. 446), take up two applications of buffer solutions as means of effecting soil analyses.

II. *The use of p-nitrophenol for assessing lime status* (pp. 252-254).—In the method described use is made of the fact that paranitrophenol half neutralized with calcium hydroxide forms aqueous solutions strongly buffered at pH 7.1. Saturated lime water sufficient to make the final solution N/25 with respect to calcium is placed in a 1-l volumetric flask, 8.34 g of paranitrophenol is added and dissolved, and the volume is made up to 1 l. In this reagent two thirds of the paranitrophenol is neutralized. The remaining procedure is thus described:

“When it is anticipated that something less than 8 mg equivalents of lime will be taken up per 100 g of soil, 8 g of the air-dry soil are placed in a 50 cc boiling tube and 40 cc of the solution is added. After an overnight period in a shaker, it is filtered, care being taken to avoid evaporation, and 25 cc is titrated with N/20 HCl, using bromocresol green as indicator. The titration is taken to the point at which the green color has almost disappeared. The flask in which the titration was done is set on one side, and 25 cc of the original solution titrated to the same color. This can be done to one drop. The difference in cubic centimeters between the two titrations equals the milligram equivalents of lime taken up per 100 g of soil. . . .

“It is not essential to have the soil continuously shaken with the solution for 16 hours, but it is important to have a contact of at least this duration, especially in the case of organic soils. A gentle shaking somewhat improves the reproductibility. With a longer contact, a little more lime is usually taken up. Sixteen hours does not, therefore, give a final figure, but is convenient, since a variation of an hour or so does not materially influence the result. When the lime uptake is large, duplicates usually fall within 2 percent of the mean, or within 0.2 mg equivalents where it is small.”

III. *The use of dihydrogen potassium phosphate in studying base exchange capacity* (pp. 255-260).—The reduction in the electrical conductivity of a mixed solution of K_2HPO_4 and KH_2PO_4 caused by the addition of soil was found to constitute a measure of the potassium uptake, and to furnish, therefore, an indication of the “base exchange capacity” of the soil at pH 7. Two disturbing factors were noted, however, and it is concluded that the method is likely to be most useful where a rapid comparison of soils of a similar nature and pH is required.

Of the two disturbing factors, the first, namely, the slightly lower mobility of the dihydrogen phosphate ion as compared with the monohydrogen phosphate ion, was found to introduce "on an average, an error of scarcely more than 1 percent." The second source of discrepancy, that is, the action of the soil in exchanging calcium or magnesium for potassium had, however, an effect such that "the fractional change in conductivity has to be increased by about 14 percent to obtain the fractional change in potassium concentration." Of this finding, it is noted that "with a set of calcareous soils this 14 percent correction might be applied, but where the figures are only to be compared one with another, no real purpose would be served. In general, a separate measurement would be needed to decide the amount of the correction, so that for the present it seems best to use the figures obtained in the way indicated above as they stand."

A comparison of field methods for determining the available phosphorus of soils, C. A. ENGBERG and C. H. SPURWAY (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 5, pp. 354-360).—This contribution from the Michigan Experiment Station reports comparative determinations made by means of four soil phosphate methods as to the phosphate requirements of two experiment fields each on the Roselawn and Onaway sandy loam soils, of three fields located on Isabella sandy loam, and of one field on Fox sandy loam.

"The results from the Illinois phosphate test [E.S.R., 62, p. 13] showed a poor correlation with the crop response of the soils to phosphatic fertilizer treatments. The test showed very little difference between soils deficient in phosphorus and those containing a large amount of available phosphorus as judged from fertilizer applications and crop yields. The Illinois phosphate test as used in this research has shown a tendency to show phosphorus deficient plats as indicated by crop response to phosphatic fertilizer as high in phosphorus. The limiting value of phosphorus in this test in most cases could be established as medium. Very few 'low' or 'doubtful' soils were found by the use of this method. The results from the LaMotte-Truog method showed a fair agreement with the crop response to phosphatic fertilizers. The results from Truog's laboratory method [E.S.R., 64, p. 312] showed a fair correlation to the crop response of the soil to phosphatic fertilizers. However, when large amounts of phosphorus were present in the soil as indicated by the LaMotte-Truog method and fertilizer applications, Truog's laboratory method did not indicate these large amounts. Only one standard is used in this method, and that may account for this variation due to the wide difference between the depth of color developed by the standard and the unknown. Because of this wide variation it is not possible to read as accurately when large amounts of phosphorus are present. The results obtained by Spurway's water-soluble phosphorus method [E.S.R., 62, p. 12] agreed fairly well with the results obtained by the use of phosphatic fertilizers.

"The limiting values as established by the LaMotte-Truog method, Spurway's water-soluble phosphorus method, and Truog's laboratory method agree quite well with the results obtained in this study. The LaMotte-Truog method and Spurway's water-soluble phosphorus method could both be recommended as field methods of determining phosphorus-deficient soils under Michigan conditions. Truog's laboratory method could be recommended for use in the laboratory to determine the available phosphorus of soils, although it is not as rapid as the LaMotte-Truog method and Spurway's water-soluble phosphorus method."

Determination of ammoniacal nitrogen in fertilizers without distillation, Z. I. KERTESZ, F. J. KOKOSKI, and A. W. CLARK (*Jour. Assoc. Off. Agr. Chem.*, 16 (1933), No. 2, pp. 233-240).—A contribution from the New York State

Experiment Station reports that ammonia in pure ammonium salts and ammonium fertilizers may be determined without distillation by replacing the ammonium in the salts by alkali metals. The ammonia replaced by the alkali is driven off in a short time by boiling, and the excess of alkali is then measured by titration with standard acid. This method gave good results in the cases of pure ammonium salts and ammonium sulfate fertilizers, although the results for other ammonium fertilizers were somewhat more divergent than those obtained in the case of ammonium sulfate. "The chief advantage of the method is that results may be obtained in much shorter time than by the usual distillation method." Working details are given, and a tabulated statement of experimental results is included.

Nitrogen changes in stored alcoholic extracts of plant tissues, J. E. WEBSTER (*Plant Physiol.*, 8 (1933), No. 1, pp. 166-168).—Using the Van Slyke method for determining the amino nitrogen as affected by various periods and conditions of storage, and an aeration method for estimating the ammonia formed, the author of this contribution from the Oklahoma Experiment Station determined some effects of reaction, time of storage, percentage of alcohol, the presence of minerals, etc., on stored alcoholic extracts of plant tissues. He reached the conclusion that reaction is probably the most important chemical factor, extremes of acidity and alkalinity inducing the largest changes recorded; and that length of time in storage is an important factor, equilibrium being reached in 1 year only in exceptional cases. The most extended period considered experimentally was 2½ years, at the end of which time "equilibrium seemed to have been reached in the solution."

With reference to the nature of the changes recorded it is pointed out that "in a few of the experiments recorded there is enough of an increase in ammonia to account for the decrease in amino nitrogen. Generally, however, the decrease in amino nitrogen is greater than can be accounted for by the increased amount of ammonia. In the case of a synthetic solution, the decrease of amino nitrogen was roughly 10 times the increase in ammonia." The occurrence of condensation reactions between either amino acids or ammonia and compounds (e. g., aldoses) having available aldehyde groups is suggested as a tentative explanation of the disappearance of amino nitrogen in excess of the ammonia formed, and some possible reactions of deamination and condensation are very briefly discussed.

The estimation of glutamine in the presence of asparagine, A. C. CHIBNALL and R. G. WESTALL (*Biochem. Jour.*, 26 (1932), No. 1, pp. 122-132).—The early observation that glutamine reacts abnormally with nitrous acid was confirmed in the course of the experiments reported, 92 percent of the total nitrogen of glutamine having been shown to react as if it were amino nitrogen in the Van Slyke apparatus. The stability of glutamine in solution at 100° at various pH values was investigated, both amide N and amino N being determined. After heating at 100° at pH 8 for 3 hours, glutamine gave 35 percent of the total N as amide N, while the amino N fell to 8.5 percent. Asparagine was shown to be stable under these conditions.

"This difference in behavior has been made the basis of a method for the separate determination of asparagine and glutamine in plant extracts," a procedure which was successfully applied to a mixture of asparagine and glutamine and also to six plant extracts of which the amide contents were known.

The isolation of asparagine from an enzymic digest of edestin, M. DAMODARAN (*Biochem. Jour.*, 26 (1932), No. 1, pp. 235-247).—A digestion of edestin nearly complete and accompanied by but little separation of amide nitrogen was shown to be attainable by subjecting the protein successively to the action of pepsin, trypsin, and yeast dipeptidase.

"Complex polypeptides, bases, dicarboxylic acids were removed from the digest by appropriate reagents and the resulting solution fractionally crystallized. From one of the crystal fractions asparagine was isolated and its presence in the protein molecule thus definitely established. To attempt to crystallize glutamine was unsuccessful, but its presence in the digest was demonstrated indirectly by the method of Chibnall and Westall" above noted.

Determination of arsenic in plant materials, R. B. DEEMER and J. A. SCHRICKER (*Jour. Assoc. Off. Agr. Chem.*, 16 (1933), No. 2, pp. 226-232).—The authors of this contribution from the U.S.D.A. Bureau of Chemistry and Soils found the recovery of arsenic from pure solutions to be complete when either the arsine evolution method or a suitable molybdenum blue reagent was used. This procedure, however, was not found to be adapted to solutions obtained by the wet ashing of plant materials. "When used with the arsenic trichloride distillation method this [molybdenum blue] colorimetric method gives good recoveries from wet ashed samples. This method is applicable to quantities of arsenic pentoxide ranging from 0.002 mg to 10.0 mg. Above 10.0 mg dilution errors enter. As no more than 0.200 mg in 50 cc is readable, the corresponding dilution of 50 to 1 for 10.0 mg reduces precision accordingly." Manipulative detail is fully described.

Qualitative detection of lead in spray residues. M. HARRIS (*Jour. Assoc. Off. Agr. Chem.*, 16 (1933), No. 2, pp. 245, 246).—The proposed method from the U.S.D.A. Food and Drug Administration, Chicago, Ill., is based on the turbidity formed on the addition of sodium bisulfite to a slightly acid or neutral solution of lead. A positive test was obtained with 0.1 mg of lead oxide when the method outlined below was used. "However as a matter of precaution 0.15 mg was used." To obviate the chance of false conclusions which might be caused by the presence of barium and strontium, the presence of lead was confirmed by conversion of the sulfite to the iodide by means of a potassium bromide-potassium iodide solution, with a subsequent microscopic identification of the lead iodide.

It was observed that the presence of foreign and organic matter interfered with the formation of the turbidity and lead iodide plates. This difficulty was eliminated by evaporating the wash solution to dryness, leaching out the lead salt with hot water, and filtering. The bisulfite was then added to the clear filtrate. The volume of wash solution that would contain about 0.15 mg of lead oxide was estimated from the previously determined arsenic value by assuming the ratio of PbO to As_2O_3 in arsenical spray residue to be 2.5 to 1.

Determination of iron in milk and other biological materials, R. STUGART (*Indus. and Engin. Chem., Analyt. Ed.*, 3 (1931), No. 4, pp. 390-393).—The author found the colorimetric method dependent upon ferrocyanide inapplicable in the cases of samples containing appreciable quantities of phosphorus and of calcium. That form of the thiocyanate method in which the ferric thiocyanate is extracted with amyl alcohol gave reliable results, but color comparison in aqueous solutions was inaccurate because of fading, either extraction was unsatisfactory, and the use of acetone as a solvent failed to prevent fading. The iron content of milk could not be determined with sufficient accuracy by either gravimetric or volumetric methods. Methods requiring the use of large quantities either of potassium or of sodium hydroxides could not be applied because of the impossibility of freeing either of these reagents sufficiently completely from iron compounds or of determining their iron content accurately enough to permit the use of a correction. Methods using only small quantities of alkali were also unreliable because of iron in the sodium hydroxide and of that dissolved during heating from the glass.

A method eliminating alkali treatment entirely was therefore elaborated, and its working detail is fully stated.

Determination of inactive malic acid in fruits and fruit products, B. G. HARTMAN and F. HILLIG (*Jour. Assoc. Off. Agr. Chem.*, 16 (1933), No. 2, pp. 277-285).—Procedure for the determination of inactive malic acid in fruits and fruit products, presented in this contribution from the U.S.D.A. Food and Drug Administration, involves (1) isolation of total malic acid (levo and inactive modifications), (2) determination of the total malic acid by oxidation with potassium permanganate in alkaline solution, and (3) determination of the inactive malic acid by subtracting the levo acid obtained polarimetrically from the total malic acid. "The procedure is easy to follow, but it is time-consuming. In the interpretation of the results obtained by the method it is necessary to make a correction of 0.01 percent."

Determination of uronic acids and methoxyl in certain plants and plant materials, M. PHILLIPS, M. J. GOSS, and C. A. BROWNE (*Jour. Assoc. Off. Agr. Chem.*, 16 (1933), No. 2, pp. 289-292).—The authors of this contribution from the U.S.D.A. Bureau of Chemistry and Soils present a brief account of work described as of a preliminary nature on the determination of the uronic acids present in food plants on the basis of the reaction of these acids with boiling 12 percent hydrochloric acid to give furfural and carbon dioxide. A quantitative yield of the furfural could not be obtained in the distillation, but the carbon dioxide yield was quantitatively measurable if the sample were first heated at 70° C. with the acid for a half hour to decompose any carbonates present, and then aerated with carbon dioxide-free air for 20 minutes. No decomposition of the uronic acids took place at 70°. This decomposition was effected by heating in an oil bath maintained at from 135° to 140° for 5 hours, and a small stream of carbon dioxide-free air carried the evolved gas into a known volume of 0.2 N barium hydroxide in an absorption tower. From such data uronic acid contents of from 3.60 to 17.72 were determined in various plant materials.

The influence of manufacturing operations upon the microbial content of grape juice, F. W. FABIAN (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 12 (1933), No. 5, pp. 141, 142; *abs. in Michigan Sta. Quart. Bul.*, 15 (1933), No. 4, p. 304).—A process for the complete commercial sterilization of grape juice and for its safe storage is detailed.

Faulty pasteurization responsible for moldy grape juice, F. W. FABIAN (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 12 (1933), No. 6, pp. 173-175, 188, fig. 1; *abs. in Michigan Sta. Quart. Bul.*, 15 (1933), No. 4, p. 304).—A hot water rinsing of the commercial equipment for the handling of grape juice failed to sterilize the system, leaving principally yeasts with some molds. A momentary heating to 150° F. before bottling appeared to sterilize the juice. An exposure to a temperature of 180° for 37 minutes after bottling and capping prevented spoilage of the bottled product.

AGRICULTURAL METEOROLOGY

Meteorological data: Progress report of special committee, D. M. BAKER ET AL. (*Amer. Soc. Civ. Engin. Proc.*, 59 (1933), No. 1, pp. 153-182, figs. 9; *abs. in Bul. Amer. Met. Soc.*, 14 (1933), Nos. 4, pp. 111-114; 5, pp. 135-142).—This is a report of a committee of the American Society of Civil Engineers, appointed in April 1931, to "give thought as to how the United States Weather Bureau could be made of greater service to engineers." The report contains numerous criticisms, suggestions, and recommendations looking toward possible improve-

ment of the scope, quality, and usefulness of the work of the Bureau, especially from the engineer's viewpoint.

Microclimatology [trans. title], R. GEIGER (*Naturwissenschaften*, 21 (1933), No. 5-7, pp. 132-137, figs. 7; abs. in *Sci. Abs.*, Sect. A—Phys., 36 (1933), No. 425, p. 449).—Reference is made to the many influences of small changes of climate from one place to another on plants, small animals, and insects and to the importance of such changes in selecting sites for sanatoria, hospitals, and dwelling houses. The effects of town dust on nocturnal temperature inversions and cloudiness and of streets and public squares on temperature changes are also discussed.

Radio Research Board: Report No. 5, Atmospherics in Australia, I, G. H. MUNRO and L. G. H. HUXLEY (*Aust. Council Sci. and Indus. Res. Bul.* 68 (1932), pp. 49, figs. 13).—While this paper deals primarily with an investigation of the atmospherics which interfere with radio reception in Australia, it discusses briefly the utility of the observations on atmospherics for weather forecasting and other matters of broader interest, the conclusion being reached that "a suitably arranged system for observing atmospherics would be of considerable assistance in meteorological work, particularly for weather forecasting, in Australia and in New Zealand."

SOILS—FERTILIZERS

[**Soil investigations of the Nebraska Station**] (*Nebraska Sta. Rpt.* [1932], pp. 14, 15).—Extending the record (*E.S.R.*, 67, p. 505) of its soil work, the station reports briefly upon the relation of weather, cultural practices, and soil conditions to nitrification in Nebraska soils; factors which affect the tilth of soils; and the use of phosphate fertilizer for the irrigated sections of eastern Nebraska.

A microbiological study of podsol soil profiles, P. H. H. GRAY and N. B. McMASTER (*Canad. Jour. Res.*, 8 (1933), No. 4, pp. 375-389, figs. 2).—Microbiological studies of samples from the separate horizons and from different depths of soils of the Appalachian upland podsol group show that the activity of the micro-organisms is dependent upon the organic matter relations in the several horizons. The organic matter horizon was biologically the most active, as shown by analyses for carbon dioxide, nitrate nitrogen, numbers of bacteria, and production of ammonia for urea. Evidence indicating that the reduced activity of the leached layer and the horizons of accumulation is not due to toxic compounds produced by leaching of the organic matter is submitted. The paper is a contribution from McGill University.

Some relationships between water plants and water soils in Michigan, J. O. VEATCH (*Mich. Acad. Sci., Arts, and Letters, Papers*, 17 (1933), pp. 409-413, pls. 2; abs. in *Michigan Sta. Quart. Bul.*, 15 (1933), No. 4, p. 302).—From about 300 observations widely distributed over the water-covered areas of Michigan, a range of pH from 6 to 9.2 was found, and a hardness of water expressed in grains per U.S. gallon from 1.5 to 20. The types of lake "bottoms", or subaqueous cumuloose horizons, were recognized. The most prolific growth of attached plants appeared on the soft, slimy, sedimentary peat bottoms and on the clayey muds; the least growth on the sand, cobbles, and hard bed rock. The conclusion was reached that most of the aquatic plants observed grow under a wide range of soil conditions, but few are limited to certain soil conditions, as, for example, *Chara*, to waters which are definitely alkaline in reaction and high in calcium.

"The observations made support a theory that many of the present acid or soft water lakes and bogs, covered with acid tolerant plants, were originally alkaline, or hard water lakes, and the change to the acid conditions has been brought about by filling of the lakes with vegetation to a point where only a small depth of water remains. At this point acid tolerant plants may gain a foothold and convert the area into an acid bog or an acid peat swamp."

The diffusion of carbon dioxide through soils, F. B. SMITH and P. E. BROWN (*Soil Sci.*, 35 (1933), No. 6, pp. 413-423, pl. 1, fig. 1).—In the investigation reported upon in this contribution from the Iowa Experiment Station the diffusion of carbon dioxide through moist soil was found to be complicated to such a degree by the production of carbon dioxide in the soil while the measurements were being carried out that an accurate determination of the rate of diffusion could not be made. "This no doubt explains why Buckingham found diffusion to be an exponential function of porosity and concluded that diffusion was not influenced to any great extent by moisture, texture, and structure." These factors were found to influence the rate of diffusion in so far as they affect porosity; and an effort was made to estimate the amount of carbon dioxide produced during the experiment and correct for it in the calculation of the diffusion coefficient. This variable was finally eliminated, however, by using air-dry soil, and more than 100 experiments were made, using air-dry soils differing in porosity. It was concluded from the data obtained that the rate of diffusion of carbon dioxide through air-dry soil is a linear function of porosity of the soil within the limits of porosity studied. "This does not mean, however, that at zero porosity, that is, soil saturated with water, that there would be no diffusion of carbon dioxide through the soil; nor that at 100 percent porosity, that is, free diffusion, this relation would hold."

The diffusion of carbon dioxide through Carrington loam in situ was determined 11 times over a period of about 5 weeks. The results obtained varied from 2.535×10^{-8} to 32.750×10^{-8} . "Since the method is subject to certain inaccuracies, caution must be observed in the interpretation of the data. However, since it is a resultant of many forces, some of which are related to the production of carbon dioxide in the soil, it would seem to be a better index of the amount of carbon dioxide produced in soils in situ than either the concentration of carbon dioxide in the soil air or the evolution of carbon dioxide from the soil alone."

Soil organic matter, R. R. McKIBBIN (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 4, pp. 258-266, fig. 1).—The physical, chemical, and biological importance of soil organic matter is emphasized. "Most Quebec soils, fertile and infertile, contain large amounts of nitrogen and organic carbon in their surface few inches in an acid state." Several groups of Quebec soils were differentiated, their properties are briefly discussed, and average and extreme analyses reported. Physical and chemical treatments, through the practical application of which it is hoped to modify favorably the organic matter resources of the most extensive soil group discussed, namely, the Appalachian upland podsol soils, are mentioned.

Influence of chemical composition of organic matter on rate of decomposition, T. L. MARTIN (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 5, pp. 341-346).—The author reports that the results of his experiments agree with the findings of Tenney and Waksman (*E.S.R.*, 62, p. 414) and others, except that the sweetclover cellulose did not break down nearly as readily as did the crude protein. The water-soluble materials in the roots and tops disappeared rapidly and at about the same relative rates for organic material from the

same source, but the disappearance was more rapid for alfalfa than for sweetclover. Alfalfa tops and roots seemed to decompose more rapidly than did sweetclover tops and roots. The lignin content accumulated very rapidly, more so in the case of roots than in that of tops. "Due in all probability to a higher percentage of lignin in the roots and to its tendency to arrest decay of cellulose, tops decompose at a more rapid rate than do the roots. Because of the slow decomposition of proteins and the rapid accumulation of lignin, there is the suggestion that the remainder will consist largely of these two substances. However, in the sweetclover tops and roots cellulose probably too will be a part of the residue."

The iodine content of the soil in Kentucky, J. S. MCHARGUE and D. W. YOUNG (*Soil Sci.*, 35 (1933), No. 6, pp. 425-435, fig. 1).—Samples of soil from the six principal geological areas in Kentucky were analyzed for iodine. The largest quantities were found in soils derived from limestone strata, while the smallest quantity occurred in the soils derived from sandstone strata in the Eastern Coal Field area. It appeared that the foods and natural waters produced in some parts of the Eastern Coal Field may be deficient in iodine to the extent that endemic goiter is more likely in this part of the State than in any other part. The soils of the Western Coal Field area were found to contain nearly twice as much iodine as those of the Eastern Coal Field. The iodine content of the Maury (phosphatic) and Mercer (nonphosphatic) soil profiles in Fayette County showed considerable variation at different depths. There was no correlation between the phosphorus and iodine content in the two profiles. Soils derived from limestone rocks appeared to contain considerably more iodine than the unaltered rock.

Soil rebuilding at the Red Plains Erosion Station, S. W. PHILLIPS (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 5, pp. 346-350).—The experiments reported upon have been carried out cooperatively by the U.S.D.A. Bureaus of Chemistry and Soils and of Agricultural Engineering, working with local agencies. The investigation included work at this station, near Guthrie in central Oklahoma, on erosion and run-off rates and fertility losses, on vegetational and other means of control, and on the reclamation of eroded soils.

A continuous cotton plat lost four times as much soil as did a plat in sweetclover, cotton, and wheat rotation. A Bermuda grass plat lost only about 2 percent of the precipitation moisture and almost no soil. A fallow plat, though it lost about twice as much moisture, lost about 10 percent less soil than did a corresponding cotton plat. Cotton on clay subsoil about doubled the run-off and erosion loss of cotton on topsoil.

Closed-end terraces in Vernon fine sandy loam saved much moisture but caused standing water damage to the crop on the terraced channels, while graded terraces effected no considerable saving of moisture and were of practical effectiveness only for soil conservation.

Of certain of the experiments on erosion control through cropping practices, the following statements are made: "Four 1-acre fields (4 percent slope) were put into strip cropping this year. The cotton was listed (bedded) in on the contour, and the thick-growing, soil-saving strips were planted to oats and Sudan grass. The row crop and soil-saving strips each occupy approximately half of the land. With one of the most intense rains (May 31, 1932) since the establishment of this station, it was observed that this method of farming almost completely stopped soil losses and very largely diminished run-off. . . . Bermuda-grass dams have proved effective in the control of small gullies, but some farmers object to starting this persistent grass anywhere on their lands. With light application of superphosphate sweetclover has caught very well in

an experiment dealing with a large gully, and shows promise of being a useful implement in controlling these major ravines. Subsoiling has not as yet shown any profitable increase in yields, but the experiments are being continued in order to determine definitely the full significance of this tillage method."

The Winogradsky spontaneous culture method for determining certain soil deficiencies, A. W. YOUNG (*Iowa Sta. Res. Bul.* 157 (1933), pp. 24, fig. 1).—Soils from 21 experimental plats on Carrington loam at the Agronomy Farm, 3 samples of soil from each of 9 outlying experimental fields located on various soil types, 2 samples of soil from Colorado, and 1 soil from Utah were tested for phosphorus deficiency by the spontaneous culture method (E.S.R., 66, p. 616). Starch, mannitol, and glucose were compared as energy sources for the development of the spontaneous cultures on the soil plates; experiments were conducted on the inoculation of soils which did not support spontaneous culture growth; and some of the phosphorus relationships of the spontaneous culture development on the soil plates were studied.

From the results recorded, it would seem "evident that the spontaneous culture test is of little value for determining the phosphorus deficiencies of the Iowa soils tested. There seems to be little possibility of modifying the test to make it of use for this purpose, since many of the soils of Iowa are too acid to permit the growth of the organisms responsible for the spontaneous cultures. It is also questionable whether this test would indicate the amounts of phosphorus which would produce the maximum economic crop yields when applied to the soils of Iowa."

Soil plates made from acid soils could be made to yield spontaneous cultures by neutralizing the soil with calcium carbonate, adding mannitol and phosphate, and inoculating with a pure culture of *Azotobacter*. Either mannitol or glucose stimulated spontaneous culture growth much more than did starch. Mannitol yielded a colony growth of a viscosity much greater than that produced from glucose. Of 17 phosphates substituted for disodium hydrogen phosphate, all appeared more or less available to the organism.

Studies on readily soluble phosphate in soils, I, II, H. W. LOHSE and G. N. RUHNKE (*Soil Sci.*, 35 (1933), No. 6, pp. 437-457, figs. 4; 459-468, fig. 1).—The first two papers of a series contributed from the Ontario Agricultural College are here noted.

I. Extraction of readily soluble phosphate from soils by means of dilute acid potassium sulfate (KHSO_4).—Readily soluble soil phosphate is defined as the amount of phosphate (expressed as milligrams P per 1,000 g of soil) extracted by shaking 2 g soil (20 mesh) for 5 minutes, with a KHSO_4 solution of such a strength that the acidity in the filtered extracts is approximately that expressed by a pH value of 2.00. An acid solvent of this strength proved to be strong enough to extract the readily soluble phosphate in a soil sample; it did not break up the difficultly soluble soil phosphate appreciably; and the acidity of the extract was high enough to prevent reprecipitation of dissolved phosphate. The readily soluble phosphate in a soil sample was adequately removed by 5 minutes of shaking.

The method used for the extraction of readily soluble phosphate from soils by means of dilute KHSO_4 solutions at a pH of 2.00 is described in working detail.

II. The vertical distribution of readily soluble phosphate in some representative Ontario soils.—Readily soluble soil phosphate, extracted by 5 minutes of shaking with a KHSO_4 solution at a pH of 2.00, varied so much in vertical distribution that surface sampling alone was found inadequate. "In determining the vertical distribution of readily soluble soil phosphate, extraction

at the same pH value in the extracts from all the horizons, is desirable. The extracts must also be at a pH value where reprecipitation of dissolved phosphate is prevented.

"Sandy podsol soils seem to be very low in readily soluble phosphate in all horizons, the parent material included. Clayey podsoles and brown forest soils contained large amounts of readily soluble phosphate in the B horizon and in the parent material. Cultivated soils of the brown forest group contained, in all cases, considerable amounts of readily soluble phosphate in the lower horizons. Extractions of profile samples from typical cultivated brown forest soils, well known as to their fertility, indicate that the extraction method (KHSO_4 method) used gives a good index to the fertility of these soils, as far as their phosphate supply is concerned."

Phosphate availability in alkaline calcareous soils, W. T. McGEORGE (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 5, pp. 351-354).—This contribution from the Arizona Experiment Station reports and discusses chemical and physical relations of plant root and soil solution in alkaline calcareous soils. Data "which quite definitely show that there will be no absorption of phosphate by the roots until the reaction (pH) of the root soil contact zone has been reduced by carbon dioxide exudation to pH 7.6, which is the reaction at which the ratio of H_2PO_4 to HPO_4 ions closely approaches equality," are emphasized, and one of the principal conclusions reached was that the infertility of alkaline calcareous soils takes in large part the form of a nonabsorption of phosphate and possibly of other ions; only to a lesser degree that of a direct alkaline toxicity. "Phosphate availability in such soil types is not a simple matter of solubility, but rather is a complex of several factors to which carbon dioxide is the key. A thorough acquaintance with these factors may be of greater assistance in estimating the phosphate requirement of a soil than a determination of phosphate solubility by means of some empirical reagent."

Nitrogen accumulation in soil as influenced by the cropping system, T. L. LYON and J. A. BIZZELL (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 4, pp. 266-272).—This contribution from the New York Cornell Experiment Station reports upon experiments undertaken for the purpose of determining the apparent fixation of nitrogen in soil of medium nitrogen content on which various cropping systems were followed without nitrogenous fertilizer but with lime, phosphorus, and potassium liberally applied. The surface soil was placed in frames and was sampled and analyzed at the beginning and end of a period of approximately 10 years. Nitrogen was determined in all of the crops produced, and a record of the removal from each of the frames was kept for the entire period. Rain and snowfall were measured and their nitrogen determined monthly during the 10 years. The cropping systems consisted of the continuous growth of alfalfa and of timothy and of 5-year rotations in which alfalfa was grown from 1 to 3 years, timothy for a similar time, and red clover 1 or 2 years. Field peas were grown with oats and hairy vetch with wheat in some of the cropping systems. The other crops used in the rotation were fodder corn, wheat, oats, and rye.

So far as yields of nitrogen in the crops were concerned, those cropping systems that included legumes, especially alfalfa, were outstanding. The more often alfalfa occurred in the rotation, the more nitrogen was contained in the crops. Timothy had the opposite effect. Red clover was not as effective as alfalfa in producing nitrogen in the crops, when grown either once or twice in the rotation. The use of peas and vetch with cereals resulted in increased yields of nitrogen. At the close of the period covered by the experiment, the soil on which legumes were grown either continuously or in alternation with

nonlegumes contained more nitrogen than did soil on which no legumes were grown. The more frequently alfalfa occurred in the cropping system, the more nitrogen was contained in the soil at the close of the experiment. Red clover grown in alternation with cereals was more effective than was alfalfa in leaving nitrogen in the soil. The effect of peas and vetch on nitrogen accumulation in the soil was only moderate, whether they occurred once or twice in a round of the rotation.

"Accretion, or what may be termed apparent fixation of nitrogen, was found by adding to the quantity of nitrogen in the crops the gain of nitrogen by the soil, or by subtracting the loss, if such occurred. The nitrogen in rain and snowfall and that in drainage were considered to offset one another." Alfalfa was somewhat more effective in nitrogen accretion than was red clover, and much more so than were peas or vetch. In the case of every cropping system there was apparent fixation of nitrogen whether legumes were grown or not. A rotation of cereals without a hay crop fixed as much nitrogen as did the rotation containing timothy. The average annual accretion of nitrogen in the cropping systems having no legumes amounted to from 20 to 30 lb. to the acre. As no nitrogen was applied in fertilizers and as the soil had a very moderate content of nitrogen the conditions were very favorable for nitrogen accretion. The nature of the crop immediately preceding appeared to be a more important factor in determining the yield of nitrogen in the succeeding crop than was a previous gain or loss of soil nitrogen, at least where such differences were large. The influence of the preceding crop appeared to be exercised through its effect on the availability of soil nitrogen. In the case of alfalfa this effect was found very large.

Soil bacteria and the fixation of atmospheric nitrogen [trans. title], G. DE' ROSSI (In *Atti del IV Congresso Nazionale di Microbiologia, Milano, 1932. Milano: Soc. Internaz. Microbiol., 1932, pp. 13-87*).—The paper is divided into sections dealing with the nitrogen-fixing power of micro-organisms and the sources of error involved, distribution of nitrogen-fixing power among micro-organisms, the *Azotobacter* group, the nitrogen-fixing *Clostridia*, the tubercle organisms of the *Leguminosae*, the nitrogen-fixing activity of the soil bacteria, and practical applications.

Of sources of error in the experimental measurement of the nitrogen-fixing power of micro-organisms the following are regarded as serious: (1) From the air, and especially from that of the laboratory, which cannot conveniently be purified, micro-organisms can take up quantities of nitrogen compounds which cannot be neglected; (2) some culture media contain volatile nitrogen compounds which are assimilated by micro-organisms during their period of growth but are liberated from the controls; and (3) many culture media, especially those prepared from soil extracts, contain nitrates and various organic nitrogen compounds, the nitrogen content of which is undeterminable or imperfectly determinable by customary methods, but will all appear in the organic compounds of the cell plasma after its assimilation by bacteria. It is considered in the highest degree probable that the nitrogen-fixing power attributed by many authors to such of the more common soil organisms as Hyphomycetes, Schizomycetes, torulae, and algae is to be explained as an error due to the causes above outlined.

The paper presents also critical summaries of the information thus far made available with reference to the groups *Azotobacter*, *Clostridium*, *Bacillus radicola*, *Rhizobium*, etc.

Studies on nitrogen absorption from culture solutions.—I, Oats, A. L. STAHL and J. W. SHIVE (*Soil Sci.*, 35 (1933), No. 5, pp. 375-399, figs. 5).—This contribution from the New Jersey Experiment Stations presents, with reference

to the behavior of oats in the solution cultures, the conclusions that "quantitative analyses show that quantity absorption of nitrogen as NH_4 (milligrams per culture per hour) is highest during the earliest period here investigated, gradually declines, and reaches its minimum point at maturity. Quantity absorption of nitrogen as NO_3 (milligrams per culture per hour) shows its minimum point at the earliest period investigated, rapidly increases, and reaches a maximum at the blossoming stage, and then rapidly declines to a secondary minimum with approaching maturity. Quantity absorption of total nitrogen attains a maximum point which corresponds to the point of maximum absorption of nitrogen as NO_3 . This occurs during the flowering period. At no time during the active life cycle was it found that the absorption of nitrogen as NH_4 or as NO_3 entirely ceased.

"Rate absorption of nitrogen as NH_4 (milligrams per gram of dry tissue per hour) is at its maximum during the earliest period here investigated, declines rapidly during the early stages of growth, and reaches a very low minimum rate with approaching maturity. Rate absorption of nitrogen as NO_3 (milligrams per gram of dry tissue per hour) is low during the early stages of development, attains its maximum at the blossoming stage, then declines to a secondary minimum at maturity. The maximum NH_4 rate of absorption of nitrogen is more than double the maximum NO_3 rate. Rate absorption of total nitrogen attains a maximum point which corresponds to the point of the maximum NH_4 rate of nitrogen absorption and is determined by the NH_4 rate. A secondary maximum rate occurs at the blossoming stage, corresponds to, and is determined by, the point of the maximum NO_3 rate.

"Two periods in the growth cycle occur when the plants show higher activity with respect to the rate of nitrogen absorption (milligrams per gram dry plant material per hour) than they do at other periods, the greatest activity occurring at a very early stage and the second period of high activity during the blossoming stage."

Further studies on nitrogen absorption from culture solutions.—II, Buckwheat, A. L. STAHL and J. W. SHIVE (*Soil Sci.*, 35 (1933), No. 6, pp. 469–483, figs. 3).—In continuation of the above, the authors find that in the case of buckwheat, quantity absorption (milligrams per culture per hour) of nitrogen as NH_4 was at its maximum at the beginning of the blossoming period, declined rapidly after blossoming, and was low during the late stages of growth. Quantity absorption of nitrogen as NO_3 was very low up to the beginning of the blossoming period, increased rapidly during the blossoming period, reached a maximum after the blossoming period, and then declined rapidly. Quantity absorption of total nitrogen attained a maximum point which corresponds to the point of maximum absorption of nitrogen as NH_4 at the beginning of the flowering period. Rate absorption of nitrogen as NH_4 (milligrams per gram of dry plant tissue per hour) began with high values, reached a maximum early in the life cycle, and showed low values only during the late stages in the growth cycle. Rate absorption of nitrogen as NO_3 "is without value" at a very early stage in the cycle, reached a maximum during the blossoming period, then declined very slowly with approaching maturity. The maximum NH_4 rate was approximately six times the maximum NO_3 rate. Rate absorption of total nitrogen attained a maximum point which corresponded to, and appeared to be determined by, the point of the maximum NH_4 rate. The NH_4 rate played a much more important role in nitrogen absorption by the buckwheat plant than did the NO_3 rate, and, during the greater part of the active life cycle, it was the predominating factor in determining the rate of total nitrogen absorption, while the NO_3 rates exceeded the NH_4 rates only in the late stages of the growth cycle, when the rates of total nitrogen absorption were very low.

A comparison of buckwheat with oats, relative to nitrogen absorption, showed that NH_4 nitrogen absorption plays a much more prominent role in buckwheat than it does in oats, while NO_3 nitrogen absorption plays a much more pronounced role in oats than it does in buckwheat.

On the nitrogen fixing micro-organisms of rice soils [trans. title], C. ARNAUDI (In *Atti del IV Congresso Nazionale di Microbiologia, Milano, 1932. Milano: Soc. Internaz. Microbiol., 1932, pp. 96-103*).—The author presents a tabulation of the results of an examination of six fields for cellulolytic aerobes of the *Cytophaga* group, and with reference to the factors limiting the growth of *Azotobacter*. These, with some related experiments, are briefly discussed.

The influence of legume versus non-legume crops on the microbiological activities in the soil.—II, Nitrification and cellulose decomposition, J. E. FULLER (*Soil Sci.*, 35 (1933), No. 6, pp. 485-491).—The present contribution from the Massachusetts Experiment Station, extending the data presented in a previous paper (E.S.R., 64, p. 18), reports that nitrification of ammonium sulfate, dried blood, and the native organic matter by the soil from different plats of an experimental field did not appear to be influenced by the presence of legume or nonlegume crops in the field. The results obtained from soil samples collected in the spring and in the fall did not differ significantly.

Cellulose (oat straw) decomposition in soil from different plats of the field as indicated by the evolution of carbon dioxide, did not appear to be influenced by the presence of legume or nonlegume crops in the field. The evolution of carbon dioxide was greater in the samples collected in the fall than in samples collected in the spring, indicating that cellulose decomposition was more active in the fall.

Nitrogen fixation studies with the soil from different plats of the field gave results comparable with those previously published. Nitrogen fixation did not appear to be influenced by the presence of legume or nonlegume crops in the field.

Nitrification, cellulose decomposition, and nitrogen fixation studied gave results which were in agreement in that there was apparently no influence exerted by the presence of legume or nonlegume crops in the field.

The results of chemical analyses of crops taken from the field, and of the soil from the field, have been published by Morse (E.S.R., 67, p. 367).

Microbiological investigations of grain plats of a single soil under various fertilizer treatments [trans. title], T. CASTELLI (In *Atti del IV Congresso Nazionale di Microbiologia, Milano, 1932. Milano: Soc. Internaz. Microbiol., 1932, pp. 88-96*).—The numbers of gelatin cultivable micro-organisms found in field soil under rational cultivation and fertilizer treatment ranged from 600,000 to 8,500,000 per gram, those of *Azotobacter* from 300 to 10,000 per gram. Cellulose decomposing forms were always found in great abundance. Early spring was found to bring a notable increase in the numbers of micro-organisms cultivable in meat broth gelatin, these including *Azotobacter* and the cellulose decomposing forms. Heavy fertilizer treatment with nitrates depressed the growth of *Azotobacter*, but the repeated addition of small quantities of nitrates or of ammonium salts appeared to favor *Azotobacter* growth. No effect of previous fertilizer treatment on the microbial population of the soil examined could be demonstrated.

Fertilizer experiments on "run-out" hay land, F. S. PRINCE, P. T. BLOOD, T. G. PHILLIPS, and G. P. PERCIVAL (*New Hampshire Sta. Bul.* 271 (1933), pp. 17, figs. 7).—The station has cropped worn-out hay lands successfully to alfalfa by meeting the fertilizer requirements of the crop. Potassium was shown to be the most important plant food requirement, its use increasing the

yield and prolonging the life of the crop. Manuring gave constant and significant increases over a 5-year period. Phosphatic plant food was less needful, and nitrogen less than either potassium or phosphorus. More than 2 tons to the acre of lime was shown to be unnecessary. The pH value did not need for alfalfa to be brought above 5.6 for the production of excellent crops. The spring and summer rainfall had some influence.

These lands needed principally nitrogen for the production of timothy, manuring being of value because of the nitrogen supply. Phosphorus was of value in the first year, but further applications did not appear to be required. Liming benefited the timothy crop.

The soils in question were found upon analysis to be relatively well supplied with nitrogen, phosphorus, and potassium; and "it would appear that worn-out hayfields such as this owe their decline in yield to a lack of available plant food, to a declining supply of rapidly decaying organic matter, and to lessened bacterial activity which would normally render native plant-food stocks available. This condition is doubtless aggravated by high acidity in the soil."

The availability of hydrated lime, limestone, and dolomite of two degrees of fineness, with supplements of red clover hay, as measured by lysimeter leachings, W. H. MACINTIRE, K. B. SANDERS, and W. M. SHAW (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 4, pp. 285-297, fig. 1).—On the basis of the four years' experiments reported upon from the Tennessee Experiment Station, it is considered that "for a soil of good fixing capacity, even without marked acidity, the 100- to 200-mesh fineness of either limestone or dolomite is comparable to an equivalence of hydrated lime, when evaluated by enhanced nitrification and sulfate generation, soluble Ca plus Mg, and repressive effects upon potassium solubility for the 4-year period. The same holds for the 40- to 50-mesh limestone. The 40- to 50-mesh dolomite is not so readily available during the first year, but the disparity is not great. . . .

"Although the total amounts of soluble Ca plus Mg derived from the several dolomite additions were generally comparable to, though slightly in excess of, those found for the corresponding limestone addition, there was a distinct difference in the proportions of the two elements present in the free soil water. This is accounted for not only by marked enhancement of soluble magnesium derived from the dolomite, but also by the diminished outgo of native magnesium where the high-calcic materials were used. The red clover hay increased the outgo of calcium and magnesium, the largest changes being noted during the first year, but this increase was due, primarily, to the amount of soluble calcium and magnesium supplied by the red clover additions. Hence, the addition of green manure did not appreciably increase loss of the Ca plus Mg supplied by the liming materials. As a close approximation, applying to all forms, one fourth of the added liming materials was lost during the 4-year period." It is noted that home ground limestone should be valued on the basis of the 40-mesh fraction.

Seasonal variation of pH in field soils a factor in making lime recommendations, J. B. HESTER and F. A. SHELTON (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 4, pp. 299, 300).—The authors of this note from the Virginia Truck Experiment Station state that seasonal variations of from 0.2 to 2.0 pH units have been observed, and cites differences of 0.47 and of 0.04 pH unit between the July and December values for a soil in its natural condition and for this soil after leaching free of readily soluble salts. It is considered that such differences should be taken into account in making liming recommendations on the basis of pH values.

Retail prices of fertilizer materials and mixed fertilizers, E. E. VIAL (*New York Cornell Sta. Bul.* 545 (1932), pp. 157, figs. 53).—Price and plant food relations in fertilizer sales in various parts of the country are analyzed, these and other related data being brought together in tabular and graphic form, some trends having been traced from the year 1882. Among the more general conclusions an important observation was that “for many crops the application of unmixed materials in addition to the regular applications of complete fertilizers has often been recommended. This is not the cheapest method of buying the additional plant food. If the additional plant food is obtained by purchasing higher analysis mixed fertilizers, the added cost would tend to be the wholesale cost of the additional plant food. If the plant food is purchased in unmixed form, the added cost is the wholesale price plus the cost of distribution. If the supplementary application of the unmixed material is considerably more efficient than the application of additional food in the mixed fertilizers, it might pay to follow this method even though the cost of plant food per unit is somewhat higher.”

It is also pointed out that “the decline in the general price level since the war has had a disastrous effect on the fertilizer industry.”

Inspection of commercial fertilizers for 1932, T. O. SMITH and H. A. DAVIS (*New Hampshire Sta. Bul.* 269 (1932), pp. 15).—This is the report for 1932 of the usual fertilizer analyses (E.S.R., 67, p. 115).

AGRICULTURAL BOTANY

How plants get their names, L. H. BAILEY (*New York: Macmillan Co.*, 1933, pp. VI+209, figs. 12).—General information is presented on the nomenclature of plants.

Plant material introduced by the Division of Foreign Plant Introduction, Bureau of Plant Industry, [April 1 to September 30, 1931] (U.S. Dept. Agr., Inventories Nos. 107 (1933), pp. 58; 108, pp. 32).—These are the usual descriptive lists of the plant introductions of the Department. A total of 1,946 lots of material is included.

Pollen-tube behavior in *Hemerocallis*, with special reference to incompatibilities, A. B. STOUT and C. CHANDLER (*Bul. Torrey Bot. Club*, 60 (1933), No. 6, pp. 397-416, pl. 1, figs. 7).—Stating that the daylilies (*Hemerocallis*), because they present all degrees of self-fertility from complete incompatibility to strong self-fertility, afford excellent material for the study of pollen tube development, the authors present the results of microscopical studies at the New York Botanical Garden of pollen tube development in various named varieties and species. Three distinct types of pollen tube behavior were observed with relation to incompatibility: (1) The tubes traveled slowly and advanced only a short distance in the stylar canal, (2) the tubes advanced to near or at the open entrance of the ovary and were there inhibited, and (3) the tubes proceeded directly into the ovary, but seeds were rarely formed. On the other hand in crosses there was no case of inhibition of pollen tube development in the upper portion of the style.

Vascular anatomy of the transition region of certain Solanaceous plants, A. F. THIEL (*Bot. Gaz.*, 94 (1933), No. 3, pp. 598-604, figs. 9).—A report of anatomical studies at the University of North Carolina upon the root-stem transition region in *Solanum tuberosum*, *Lycopersicum esculentum*, and related plants.

Callusing and rooting of cotton stem cuttings, H. E. REA (*Plant Physiol.*, 7 (1932), No. 4, pp. 733-737; *abs. in Texas Sta. Circ.* 68 (1932), p. 31).—A preliminary experiment was completed on a special method of callusing cotton

stems, and a study was made of the relative adaptability of cotton and horticultural plants to propagation by cuttings, in which many of the precallused cotton cuttings were used.

Results obtained with cotton cuttings confirmed those on callusing obtained earlier (E.S.R., 65, p. 817). Under identical conditions the proportion of cotton cuttings striking root was markedly lower than for lilac chaste-tree, Fortune forsythia, pomegranate, Chinese arborvitae, or Vanhoutte spirea. Selection of mature wood seemed important in the winter propagation of cotton cuttings, the soft and medium mature cotton cuttings used in the experiment being worthless. Precallusing of mature cotton cuttings did not prove of value, but dipping the cuttings in paraffin increased slightly the percentage of rooting. The highest percentages of rooting with mature cotton cuttings were secured in an exposed greenhouse bed of quartz sand free of substratum.

The daily growth of *Zea mays*, W. E. LOOMIS (*Amer. Jour. Bot.*, 19 (1932), No. 10, p. 838).—Young corn plants, according to Iowa State College studies, grow in height only when the temperature exceeds a minimum of about 10° C. (50° F.), and the growing point is well supplied with water. Direct sunlight causes a marked water deficit in the aboveground portions of the plant, even though the roots are liberally supplied with moisture, and quickly stops elongation. However, growth is not checked by light when the light intensity and humidity relations are such that the growing point can obtain a normal supply of water. Well-watered corn grew fastest just before sundown or on warm, cloudy days.

The production of gum by certain species of *Rhizobium*, D. A. ANDERSON (*Iowa Sta. Res. Bul.* 158 (1933), pp. 25-56, figs. 2).—The production of gum by various species of *Rhizobium* under different environmental conditions was studied, and efforts were made to determine whether or not gum production would serve to differentiate species.

Preliminary tests showed the gravimetric method used by some investigators for determining the gum content of bacterial cultures to be very slow. Certain organisms produced a marked increase in the viscosity of their solution cultures, while other cultures failed to cause appreciable increases. With high viscosity cultures, the viscosity developed was directly proportional to the amount of gum present in the solution, and viscosity measurements were, therefore, used to determine the relative gum production in solution cultures.

In the cultures tested, the viscosity of solution cultures was found to be entirely unchanged by vigorous shaking, thus indicating that the gum does not form a structure like that present in a gelatine solution, and that the gum probably is an integral part of the solution rather than a capsule around the bacterial cell. Measurable changes in the viscosity of the cultures were not produced by additions of small quantities of acid or alkali.

Whether or not the cultures received a light or heavy inoculation their viscosities were the same at the end of 7 days' incubation, suggesting that for a given concentration of sugar an equilibrium may exist between the amount of gum produced, the quantity of sugar transformed, and probably the number of organisms developing. In certain cultures, the accumulation of gum proceeded steadily in all of the cultures up to the fifth day. From then on some cultures did not increase further in gum content, while others showed a decrease in the rate. After 7 and after 14 days' incubation, some cultures tested showed about the same gum content, while others showed a decrease in the second week. Considerably more gum was produced at the optimum temperature than above or below, indicating that gum production is probably a normal metabolism process. When cultures of *Rhizobium* were grown in 500-, 250-, and 125-cc

Erlenmeyer flasks each containing 100 cc of medium, the most gum in all cultures tested was produced in flasks allowing the largest surface exposure, and gum production became smaller as the surface area exposed was decreased.

Since ability to produce a viscid solution seemed to characterize certain species of *Rhizobium*, differences in viscosity-producing power might be of value in differentiating species. In viscosity tests made on 59 strains representing 8 different species, the cultures were grouped on the basis of ability to increase the viscosity of a glucose-yeast-extract medium. The first group, including strains of *R. meliloti*, *R. japonicum*, *R. lupini*, and the cowpea bacteria, produced little or no increase in the viscosity of the culture solution, while organisms of the second group, including *R. trifolii*, *R. leguminosarum*, *R. phaseoli*, and probably the *Dalea* bacteria, produced a marked increase in the viscosity of the culture solutions. The viscosities of these cultures ranged from 1.2 to 2.4 times that of the sterile medium. Differences in the chemical nature of the gums produced by the various species seemed to play an important part in determining the ability of the organisms to increase viscosity of the solution cultures.

Purified gum supplied as a carbohydrate source for growth of *Rhizobium* evidently was not utilized by the organisms under the conditions of the experiment.

Photosynthesis in various portions of the spectrum, G. R. BURNS (*Plant Physiol.*, 8 (1933), No. 2, pp. 247-262, figs. 3).—Using as a measure the change in the amount of carbon dioxide in an artificial atmosphere, data were obtained at the Vermont Experiment Station on the photosynthetic activity of white pine, Norway spruce, and Engelmann spruce seedlings held at a constant temperature of $28^{\circ} \pm 0.5^{\circ}$ C. in gas sealed jars exposed to the light of four 1,000-w Mazda lamps passed through a water filter alone and through water filters plus various color filters, including red, red-yellow, and blue-violet. Infrared radiation of wave lengths longer than 1,100 $m\mu$ proved detrimental to photosynthesis, and the author assumes that radiations of wave length longer than 720 $m\mu$ are useless in photosynthesis. With Norway spruce the relative quantum yields in the wave lengths 720-630, 720-560, and 470-390 $m\mu$ were 9.5, 10, and 5, and with pine 9.5, 11, and 5. The actual quantum yield with pine was found to lie between 5 and 12 quanta per mole of carbon dioxide.

A review of recent work on the effect of ultraviolet radiation upon seed plants, H. W. POPP and F. BROWN (*Bul. Torrey Bot. Club*, 60 (1933), No. 3, pp. 161-210).—This review, embracing 173 titles, deals with the effect of ultraviolet radiation upon seed germination and early growth of seedlings, general and specific effects upon more mature plants, and other effects upon seed plants.

Effect of various chemicals on the respiratory rate and sugar content of potato tubers, L. P. MILLER (*Amer. Jour. Bot.*, 19 (1932), No. 10, p. 840).—When whole tubers were subjected to the vapors of ethylene chlorohydrin, ethylene bromohydrin, ethyl mercaptan, hydrogen sulfide, ethyl disulfide, and acetaldehyde, large increases in the respiratory rate were observed to take place, whereas ethyl alcohol causes a decrease in respiratory activity. Such increases occurred very soon after the treatment (24-hour treatment period) began, and reached their maximum the second or third day after the treatment, after which the respiratory rate of the treated tubers gradually fell to a value approaching that of untreated samples. Although many of these treatments resulted in increases in the sucrose content of the tubers and respiratory responses have often been attributed to sugar changes, the results did not indicate that this increased respiratory activity is caused by sugar increases. This was shown by ethylene chlorohydrin treatments, in which the largest respiratory

increase occurs very definitely before the sugar increase and there is a drop in sugar content at the period of greatest respiratory activity. The sugar content subsequently rises while the respiratory rate is falling.

Effect of chemical treatments of dormant potato tubers on the conductivity of the tissue and on the leaching of electrolytes from the tissue, J. D. GUTHRIE (*Contrib. Boyce Thompson Inst.*, 5 (1933), No. 1, pp. 83-94, figs. 2).—Treatment of dormant potato tubers with ethylene chlorohydrin produced small but significant increases in the conductivity of the tissue and increased the leaching of electrolytes from the tissue when placed in water. Treatments with potassium thiocyanate produced changes somewhat smaller but similar to those produced by ethylene chlorohydrin. Changes observed with thiourea treatments were slight and usually insignificant.

The effect of ether and chloroform upon the rate of photosynthesis in detached leaves of *Acer negundo*, R. H. WALLACE (*Amer. Jour. Bot.*, 19 (1932), No. 10, pp. 847, 848).—At the Connecticut State College quantitative experiments with ether and chloroform showed that lethal doses are required to stop the process of photosynthesis in detached leaves placed in hermetically sealed containers immersed in a constant temperature bath at 25° C. (77° F.). In numerous cases the application of sublethal concentrations of ether increased the rate of photosynthesis, due apparently to an increase in stomatal opening. It was found impossible to obtain opening of the stomata with chloroform treatment.

Effects of illuminating gas on young oak trees, C. G. DEUBER (*Amer. Jour. Bot.*, 19 (1932), No. 10, p. 845).—At Yale University the roots, dormant buds, and entire potted trees of red and black oak were subjected to atmospheres of illuminating gas mixed with air. With dormant trees gas hastened the opening of buds, but in large volumes and with long exposure inhibited bud development and even killed the trees. Hypertrophy of the root lenticels was induced by gas exposure.

GENETICS

Linebreeding, J. L. LUSH (*Iowa Sta. Bul.* 301 (1933), pp. 337-368, figs. 14).—This discusses the meaning of linebreeding, the concentration of the blood of a single individual, as distinguished from inbreeding, which involves especially the reduction in the number of ancestors.

Examples of different types of pedigrees of cattle, sheep, and swine are presented, with the coefficients of inbreeding and relationship calculated according to the methods of Wright and McPhee (*E.S.R.*, 54, p. 324).

Inbreeding and homozygosis, S. WRIGHT (*Natl. Acad. Sci. Proc.*, 19 (1933), No. 4, pp. 411-420, figs. 10).—This paper presents the theoretical calculation for the decrease in heterozygosis for sex-linked genes under different systems of mating.

Inbreeding and recombination, S. WRIGHT (*Natl. Acad. Sci. Proc.*, 19 (1933), No. 4, pp. 420-433, figs. 10).—This is a theoretical study of the recombination of sex-linked genes expected in case of different kinds of matings as determined by the correlations observed.

“The general conclusions from this analysis are that different pairs of allelomorphs, even in the same chromosome, come to be combined practically at random in any freely interbreeding population of long standing, and that there is practically random combination among the genes fixed in different inbreeding subgroups of a population unless these subgroups are very small or linkage is extremely close.”

On sexual incompatibility of tetraploid hybrids of *Raphanus* × *Brassica* [trans. title], G. D. KARPECHENKO and S. A. SHCHAVINSKAĬA (SHCHAVINSKAYA) (In *Trudy Vsesoiūznogo S''ezda po Genetike, Seleksii, Semenovodstvu i Plemennomu Zhivotnovodstvu* (Proceedings of the U.S.S.R. Congress of Genetics, Plant- and Animal-Breeding), Leningrad, 1929. Leningrad: Izd. Redaktsionnoi Kollegii S''ezda, 1930, vol. 2, pp. 267-276, figs. 4; Eng. abs., pp. 275, 276).—No crossing was observed to take place in the open field between the fertile tetraploid hybrid of *Raphanus sativus* × *Brassica oleracea* and either parent. Where flowers of the hybrid were treated with a mixture of pollen, including their own, self-pollination occurred. The incompatibility of the hybrid with either parent is attributed to its doubled chromosome complex. According to its morphological characters, fertility, and constancy the hybrid known as *Raphanobrassica* may well be considered as a new genus and a possible example of how other constant breeding forms of plants have originated.

A contribution to the synthesis of a constant hybrid of three species [trans. title], G. D. KARPECHENKO (In *Trudy Vsesoiūznogo S''ezda po Genetike, Seleksii, Semenovodstvu i Plemennomu Zhivotnovodstvu* (Proceedings of the U.S.S.R. Congress of Genetics, Plant- and Animal-Breeding), Leningrad, 1929. Leningrad: Izd. Redaktsionnoi Kollegii S''ezda, 1930, vol. 2, pp. 277-294, figs. 11; Eng. abs., pp. 293, 294).—In an attempt to secure a constant breeding hybrid of three species, *Raphanobrassica* was crossed with various crucifers, including *Brassica carinata*, swede turnip, Colza rape, horseradish, and common turnip. Crosses were readily made with *B. carinata*, despite the fact that the radish and cabbage parents of *Raphanobrassica* do not cross with this species. The resulting seedlings were normal, vigorous plants intermediate between the two parents. All hybrids were true triheterogenomous plants, and it is concluded that in the F_2 generation there should appear forms with 6-paired homological genomes which ought to be fertile and constant.

Hereditary radium-induced variations in the tomato, E. W. LINDSTROM (*Jour. Heredity*, 24 (1933), No. 4, pp. 128-137, figs. 5).—As a result of experiments at the Iowa State College in which seeds, growing tips, and young developing fruits of the tomato were radiated with Monel needles having an actual radium content of 12.3 mg, there was observed a large amount of general sterility, pollen abortion, and morphological abnormalities, some of which disappeared in subsequent generations. However, six heritable recessive variations were obtained, three affecting chlorophyll, two morphological characters, and one causing sterility and stunting of the entire plant. At least three of the heritable variations were wholly different from any previously known in the tomato. Since these variations behaved genetically as simple monogenic characters, they are designated as gene mutations and are conceded to be possibly due to minute deletions of the chromatin material. The chromosome counts in all six variations were normal and typical of the species.

Studies in human inheritance, VII-IX (*Ohio Jour. Sci.*, 32 (1932), Nos. 2, pp. 152-157, figs. 6; 3, pp. 232-236, figs. 5; 5, pp. 436-440).—These papers continue the series previously noted (E.S.R., 69, p. 32).

VII. Hemophilia, L. H. Snyder.—The doubtful occurrence of hemophilia in women is pointed out in selected examples from a large number of human pedigrees.

VIII. Dominance in man, with especial reference to polydactylism, D. Dehus and L. H. Snyder.—Attention is called to the fact that apparent cases of dominance in man may prove to be recessive characters when the full information is available. Several pedigrees involving the inheritance of polydactylism and syndactylism in man are presented to illustrate this view.

IX. *The inheritance of taste deficiency in man*, L. H. SNYDER.—An analysis is given of 800 families with reference to their ability to taste phenyl thiocarbamide. There were 3,643 parents and offspring in this group, of which 70.2 percent were tasters and 29.8 were nontasters. Good agreement was obtained between the observed and calculated behavior of the children based on the probable genotype of the heterozygous parents according to their frequency of occurrence in the population and assuming that this character is controlled by a single pair of Mendelian factors.

Inbreeding and the genetic history of the Rambouillet sheep in America, W. F. DICKINSON and J. L. LUSH (*Jour. Heredity*, 24 (1933), No. 1, pp. 19–33, figs. 4).—The results of a study of the amount of inbreeding in Rambouillet sheep are reported from the Iowa Experiment Station.

Studies were made of the pedigrees of 382 lambs born in 1896 and random samples of 400 born in 1906 and 800 born in 1916 and 1926, respectively, as reported in the American Rambouillet Record. Coefficients of inbreeding and relationship were calculated, and the study was conducted according to the sampling method developed by Wright and McPhee (*E.S.R.*, 54, p. 324). The coefficients of inbreeding and inter se relationship calculated for these years were, respectively, 2.2 ± 0.4 and 5.2 ± 0.8 , 3.8 ± 0.4 and 1.5 ± 0.6 , 3.7 ± 0.3 and 2.7 ± 0.4 , and 5.5 ± 0.4 and 2.6 ± 0.4 .

The studies indicated that the relationship of individual animals to the breed showed important changes between 1896 and 1906. On account of the many importations in that period, no single individual had a very important influence on the breed, the maximum relationship of any individual to the breed being 14.4 percent in 1896, and few exceeded 6 percent.

Tracing the pedigrees back showed that foundation animals for which no pedigrees were available were born just preceding 1894, but some were born as far back as 1880.

The average interval from generation to generation was 4.2 or 4.3 years in the four periods studied.

The genetic relation between body color and eye color in rabbits [trans. title], H. NACHTSHEIM (*Biol. Zentbl.*, 53 (1933), No. 1–2, pp. 99–109).—The author describes the influence of the various color genes, including the allelomorphs of the albino series, and spotting on eye color and coat color in the rabbit.

Rexing the lilac rabbit, R. T. PARKHURST and W. K. WILSON (*Jour. Heredity*, 24 (1933), No. 1, pp. 35–39, figs. 5).—The following F_2 population with normal and rex coats, respectively, was produced from the mating of a castorrex buck ($AA\ BB\ DD\ rr$) with lilac does ($aa\ bb\ dd\ RR$): Agouti, 190 and 44; blue agouti, 62 and 16; black, 42 and 16; blue, 15 and 5; chocolate agouti, 52 and 11; lilac agouti, 31 and 7; chocolate, 21 and 3; and lilac, 7 and 2.

The relation of sulphydryl concentration to size inheritance in the rabbit, P. W. GREGORY and H. GOSS (*Amer. Nat.*, 67 (1933), No. 709, pp. 180–185).—Determination was made of the sulphydryl content of the carcasses of different sized newborn rabbits after 48 hours' fasting. The size differences in the races used seemed to be related to the amount of sulphydryl present due to differences in the rate of cell multiplication, which is regulated by the sulphydryl concentration.

The inheritance of iso-hemagglutinogens in rabbits, R. D. CAMERON and L. H. SNYDER (*Ohio Jour. Sci.*, 33 (1933), No. 1, pp. 50–54).—The presence of one iso-hemagglutinin in rabbits seems to behave as a unit factor dominant to its absence, whereas another iso-hemagglutinin seems to be due to two allelomorphous factors. Data on the inheritance of these iso-hemagglutinogens in 429

rabbits showed that the best fit to the observations was obtained from the hypothesis based on the action of three allelomorphs.

A further study of blood groups of the rabbit, C. E. KEELER and W. E. CASTLE (*Natl. Acad. Sci. Proc.*, 19 (1933), No. 4, pp. 403-411).—Studies of young and immature rabbits showed that the hemagglutinins were developed as early as the fifteenth day of gestation. In a litter of 8 embryos from an H_1 female \times an H_1H_2 male there were 2 H_1 , 5 H_1H_2 , and 1 IH_2 embryos, found as determined by pulping the entire embryo in citrate solution, since the blood could not be obtained. Hemagglutinogens are apparently developed in or on the red cells, and it was impossible to separate them. As in case of the red cells, agglutinogens did not pass through the placenta. However, agglutinins do pass through the placenta, as determined in the young of a $O \times O$ mating in which the doe received blood injections from an H_1H_2 rabbit. The blood of the young was devoid of H_1H_2 agglutinogens, i.e., red cells were not agglutinated, but both agglutinins were present and agglutinated red cells from H_1H_2 rabbits.

The agglutinating properties of blood were tested in 7 of the 16 possible combinations of donors to recipients, and it was found that agglutinins were produced in the recipient when blood bearing different agglutinogens was transferred from the donor. The agglutinogens are inherited, and the genes for them are completely dominant. The agglutinins are specific antibodies produced in response to the presence of agglutinogens.

It is suggested that a somewhat different situation exists in man, in that the presence of an agglutinin is due to the absence of an inherited agglutino-gen to absorb it.

Waved: An autosomal recessive coat form character in the mouse, F. A. E. CREW (*Jour. Genetics*, 27 (1933), No. 1, pp. 95, 96).—A mutation called "waved", involving waves in the hair of the young mouse which disappear with age, is described. In three types of matings "waved" proved to behave as a single recessive autosomal character.

Preliminary symbols for a tail-mutation in mice, N. DOBROVOLSKAIA-ZAVADSKAIA (*Amer. Nat.*, 67 (1933), No. 709, pp. 186-188).—Symbols are suggested for describing the tail mutations in mice. These include reduced numbers of coccygeal vertebrae (brachyury) and two kinds of kinky tail, as well as other variations.

Inherited and acquired factors in resistance to infection, I, II, L. T. WEBSTER (*Jour. Expt. Med.*, 57 (1933), No. 5, pp. 793-817, figs. 2; pp. 819-843, figs. 6).—Two papers in this series are briefly noted.

I. Development of resistant and susceptible lines of mice through selective breeding.—The hybrid strains of albino mice at the Rockefeller Institute showed a mortality of 37.4 ± 1.6 percent when 771 mice were treated with uniform doses of *Bacillus enteritidis* by a standardized method. By selection based on the mortality of the young, but without treatment of the parents, susceptibility to the treatment was increased to an average of 60.9 percent for 18 lines in the first generation. The susceptibility was further increased to approximately 80 percent in the fifth and sixth generations by the same method of selection.

Resistant strains were selected in a similar manner. The average mortality of these strains in different selections subjected to the test varied from 11.3 to 20.1 percent. The susceptibility and resistance, respectively, were not increased in the later generations of selection.

The F_1 progeny of a cross of a susceptible line showing 89 percent mortality with a resistant line showing 15 percent mortality were 17.7 percent susceptible, but mortality in the back-cross to the susceptible line was 61.2 percent, and in

the back-cross to the resistant line 26.3 percent. The mortality in the F_2 generation was 34.2 percent.

The results indicate that the resistance is due to multiple factors of which one or more are dominant but not sex-linked. Segregation of the factors was demonstrated in the back-cross and F_2 generations. When exposed to herd infection the lines acted consistently with the results obtained from direct inoculation.

II. *A comparison of mice inherently resistant or susceptible to Bacillus enteritidis infection with respect to fertility, weight, and susceptibility to various routes and types of infection.*—In attempting to study further the nature of the degree of resistance to *B. enteritidis* noted in various strains of mice in the above paper, the rate of mortality to intrastomachal, subcutaneous, intraperitoneal, intravenous, and nasal inoculations of *B. enteritidis*, *Pasteurella avicida*, *B. friedlaenderi*, pneumococcus, and the virus associated with louping ill were investigated.

The strains susceptible to *B. enteritidis* administered by the intrastomachal method were likewise susceptible to the organism administered in other ways and to the intranasal administration of *P. avicida*, *B. friedlaenderi*, and pneumococcus, but not so susceptible to the virus of louping ill as strains that were more resistant to *B. enteritidis*. There were no significant differences in the resistance to the organisms administered intraperitoneally.

From these results it is concluded that the resistance of the animal to these organisms is general and not due to a special mechanism in certain parts. The inherent resistance to *B. enteritidis* was associated with the relative weight of different strains, but was not related to fertility.

[Genetic factors that determine hatchability] (*Connecticut Storrs Sta. Bul.* 181 (1932), p. 7).—A brief description is given of the homozygous creeper embryos surviving the typical lethal period at the end of the third day of incubation.

Collateral and ancestral correlations for sex-linked transmission irrespective of sex, E. CHARLES (*Jour. Genetics*, 27 (1933), No. 1, pp. 97-104).—Theoretical correlations expected in case of complete and incomplete dominance for sex-linked inheritance between relatives, with equal distribution of the sexes, are presented.

Partial sex reversal in the fowl, F. D. REED and C. L. MARTIN (*Poultry Sci.*, 12 (1933), No. 2, p. 90, fig. 1).—A brief account is given of a hen which had previously been a good layer, but subsequently developed male secondary sex characters. On post-mortem examination two typical testicles of normal appearance were found.

The hypophyseal substance giving increased gonadotropic effects when combined with prolan, H. M. EVANS, M. E. SIMPSON, and P. R. AUSTIN (*Jour. Expt. Med.*, 57 (1933), No. 6, pp. 897-906).—A synergistic effect of mixtures of prolan and hypophyseal preparations on ovarian development was demonstrated by the markedly greater weight of the ovaries of the test animals, to which both prolan and the growth-promoting and gonadotropic hormones of the hypophysis were administered, than was obtained by combining the weights of the ovaries of animals to which only one of the preparations was given. The essential hypophyseal hormone was administered with either the gonadotropic or the growth-promoting factors, but the essential material was prepared sufficiently free of both of these hormones to indicate that neither was responsible.

Recent advances in the chemistry and biological assay of oestrin, G. F. MARRIAN (*Physiol. Rev.*, 13 (1933), No. 2, pp. 185-221).—A review is given of recent advances in chemistry which have resulted in the isolation of the oestrus-producing hormone from the ovarian follicle in pure crystalline form.

Rat seminal vesicles and prostate glands as quantitative indicators of testicular hormone, I. B. HANSEN (*Endocrinology*, 17 (1933), No. 2, pp. 163–179, figs. 2).—A study was made of the condition of the prostate gland and seminal vesicles of rats at intervals after castration and after subsequent injections of the testicular hormone. The method giving the most satisfactory and uniform results involved the administration of 10 daily doses of the hormone beginning on the day following castration. Attempts were made to measure the dose of the hormone quantitatively by the changes in these glands. The indices proving most satisfactory as quantitative measures in the seminal vesicles were the presence of secretion, secretory granules with halo, and cell height. Epithelial height and the presence of light areas in the prostate proved efficient measures of doses of from 0.15 to 1.5 bird units. Doses from 0.4 to 7 bird units were measured by the seminal vesicles.

Experimental studies on the hypophysis cerebri.—I, The effect of single pregnancy in the albino rat, S. I. STEIN (*Endocrinology*, 17 (1933), No. 2, pp. 187–198, figs. 6).—A comparative study of the hypophyses of control rats and rats in their first pregnancy showed no differences in the number, size, shape, nuclear pattern, staining reactions, or distribution of the cells in the gland. No definite type of cells was found in the pregnant groups that could be designated as the so-called “pregnancy cells.”

FIELD CROPS

[Field crops investigations in Nebraska] (*Nebraska Sta. Rpt.* [1932], pp. 10–14, 29–31, 36, 37, 40, 41, 42, 43, 44).—Research with field crops (E.S.R., 67, p. 517) again reported on from the station and substations included variety tests with oats, barley, spring and winter wheat, corn, and alfalfa; breeding work with corn, wheat, oats, and alfalfa; studies of selection for seed purposes, degeneracy in seed stocks, and strain tests, all with potatoes; cultivation (including planting) experiments with corn, potatoes, sorgo, and sugar beets; the draft of corn and alfalfa on soil moisture; control of stinking smut in wheat; crop rotation and fertilizer experiments involving corn, wheat, and oats; rotation and tillage studies on dry land; and rotations under irrigation. Several lines of work were in cooperation with the U.S. Department of Agriculture.

[Agronomic investigations in the Virgin Islands, 1932], G. BRIGGS and C. L. HORN (*Virgin Islands Sta. Rpt.* 1932, pp. 3, 7–11, 13, figs. 2).—Field crops work (E.S.R., 67, p. 518) again reviewed briefly included variety trials with grain sorghum, sorgo, broomcorn, sugarcane, tobacco, sweetpotatoes, cowpeas, velvetbeans, pigeonpeas, alfalfa, and miscellaneous legumes; breeding work with corn and sugarcane; production and palatability tests with forage grasses; storage experiments with sweetpotatoes; and control of pink bollworm.

Chemical composition of native Alaskan hays harvested at different periods of growth, R. G. CAPEN and J. A. LECLERC (*Jour. Agr. Res.* [U.S.], 46 (1933), No. 7, pp. 665–668).—Analysis by the U.S.D.A. Bureau of Chemistry and Soils of 51 samples of 6 forage plants, grown at the Alaska Experiment Station at Fairbanks in 1929, for moisture, ash, crude protein, fat, fiber, and sugar, showed that as the season advanced the percentage of protein decreased, especially in *Calamagrostis* sp., while the percentage of fiber increased. The ash content of sedge (*Carex* sp.) and *Calamagrostis* sp. was higher than that of cotton grass (*Eriophorum* sp.) at every growth stage. The ash content of *Calamagrostis* sp. was higher in late cuttings than in the earliest, while the

reverse was true with cotton grass and sedge. Sedge and cotton grass slightly exceeded *Calamagrostis* sp. in fat content. The native forage plants of Alaska on the whole compared favorably with vetch and brome grass but not with yellow-flowered alfalfa.

Since the feeding values of the native hays decrease rapidly after August as shown by the decrease in protein and the increase in fiber, it would seem advisable to harvest these varieties late in August or early in September.

A comparison of the wet and the dry methods of inoculating legume seed, H. W. BATCHELOR and I. H. CURIE (*Ohio Sta. Bimo. Bul.* 162 (1933), pp. 71-74).—Field and greenhouse tests on 6 commercial soybean inoculation cultures in 1932 gave indications that the newer types of dry cultures are inferior to the older types of wet cultures in number of nodule-forming bacteria supplied per pound of seed, as well as in ability to inoculate as many plants and to produce as large yields of nodules. The dry method of applying inoculation appeared distinctly inferior to the wet method.

Recent progress in breeding borer resistant corn, A. R. MARSTON (*Mich. Sta. Quart. Bul.*, 15 (1933), No. 4, pp. 264-268, fig. 1).—Further progress (E.S.R., 67, p. 33) was made in efforts to produce strains of corn markedly resistant to European corn borer by crossing native varieties with Maize Amargo, inbreeding, and selection. Maize Amargo, it was established, has a heritable characteristic making it resistant to borer attack. From crosses between Maize Amargo and native corn, strains evidently may be selected which apparently are as resistant as pure Maize Amargo. Belief that such resistance is due to late maturity of the resistant lines was not warranted since some of the most highly resistant were as early as the very susceptible Duncan, while some susceptible lines were much later. That resistance in selected Maize Amargo × native corn inbreds is not due to lack of vigor was demonstrated by the susceptibility of the native corn × native corn inbreds equally lacking in vigor, and by the continued resistance of selected blends of Maize Amargo × native corn inbreds, such blends having regained full vigor and productivity.

Rate of planting corn for grain, J. R. DUNCAN (*Mich. Sta. Quart. Bul.*, 15 (1933), No. 4, pp. 292, 293).—Early, medium, and late varieties of corn were planted in 3.5 by 3.5 ft. hills at rates of 2 to 6 kernels per hill, during the period 1928-31. The results indicated that large-growing varieties, requiring the full season to mature, will give the most and best grain at 3 kernels, while earlier and shorter sorts will do best at 3 to 4 kernels per hill, and will decrease in yield and quality with heavier planting rates. The percentage of marketable ears of the late corn was greatest in thin plantings, gradually decreasing as the planting was thicker. In medium and early strains there was no decrease in marketable ears until more than 4 kernels per hill were planted.

Cultivation of corn, H. L. BORST and G. M. MCCLURE (*Ohio Sta. Bimo. Bul.* 162 (1933), pp. 75-77).—Corn grown during the period 1926-32 on two soil types at Columbus was hoed only to remove weeds, cultivated (usually three times) to control weeds, and given more cultivation (usually four times) when needed to control weeds. On the dark Brookston silty clay loam, no cultivation treatment resulted in higher shelled corn yields than were made when the weeds were hoed only. On the light Miami silty clay loam cultivated plats averaged 3 bu. more corn per acre than on hoed plats, and one or more cultivations in addition to those needed for weed control resulted in a further increase of nearly 3 bu. Fodder yields showed similar gains. There was evidence of higher soil moisture contents on the cultivated plats, especially on the Miami soil.

Breeding varieties of cotton to meet the needs of mechanical harvesting, D. T. KILLOUGH (*Valley Farmer*, 5 (1932), No. 9, p. 1; *abs. in Texas Sta. Circ.* 68 (1932), p. 26).—A popular account of the progress of efforts to develop a strain of cotton adapted to mechanical harvesting.

Effects of varying amounts of potash on oil and protein and on the weight and percentage of cotton seed, J. F. O'KELLY, W. W. HULL, and M. GEIGER (*Mississippi Sta. Tech. Bul.* 20 (1933), pp. 8, figs. 3).—Seed cotton grown in fertilizer tests at the station and at the Raymond and Poplarville Substations, and in simple side-dressing trials involving potash salts, was examined for oil and protein content, seed size, and lint percentage.

Application of fertilizer containing nitrogen and phosphorus alone resulted in a decrease in oil content as compared to the oil content of seed produced without fertilizer. Addition of potash to the fertilizer increased the oil content and usually each successive potash increment produced a corresponding increase in the oil per ton of seed, especially where such increments increased yields of seed cotton. On the other hand, nitrogen and phosphorus without potash increased the protein content above that produced without fertilizer. Potash increments added to the mixture decreased the protein content, but not always in direct proportion to the amount applied. Yields of seed cotton were increased more than enough to offset this depressing effect of potash on the protein content, and more protein per acre was produced where potash was used than where it was omitted. In general, potash tended to increase the weight of the seed and to decrease the seed percentage, but probably not to a significant extent.

Comparative advantages of jute and cotton baggings for American cotton bales, J. W. WRIGHT and R. J. CHEATHAM (*U.S. Dept. Agr., Bur. Agr. Econ.*, 1933, pp. [2]+24, pl. 1, figs. 3).—The status of jute and cotton as bale covering materials is reviewed, and the merits of the two materials are compared. Jute can withstand the rough handling which cotton bales receive, but it lacks durability, has excessive weight, and the presence of jute fibers in cotton causes spinning losses. Cotton bagging is durable, light, and contributes to neatness of the package. It is thought that the lower cost of jute bagging may be offset by the greater re-use value of cotton bagging, savings in freight and insurance and in cotton adhering to bagging, and increased consumption of cotton.

Variable practice in milo production, H. H. FINNELL ([*Oklahoma*] *Panhandle Sta., Panhandle Bul.* 49 (1933), pp. 8).—Examination of grain yield data obtained from systematic and variable practices in milo production over the period 1924–32 showed that with an inflexible system, best results have been obtained by regularly fall listing and planting a full stand, although it might be highly profitable to use soil moisture indications to determine a successful variable practice. The first possibility is in the fall when useless or possibly detrimental tillage may be eliminated if moisture favoring proper listing is lacking. Taking account of any moisture deficiency within 3 ft. of the surface at planting time permits a corresponding reduction in the stand that favors a more efficient use of available moisture.

Growing combine grain sorghums, L. C. AICHER (*Kansas Sta. Circ.* 170 (1933), pp. 19, figs. 14).—Cultural and harvesting practices suitable for growing grain sorghums to be harvested with the combine are outlined, largely from experiments at the Fort Hays Substation. The characteristics of varieties for the purpose are described.

Wheatland, the best variety available, a straight-necked kafir-milo hybrid bred by J. B. Sieglinger of the U.S. Department of Agriculture at Woodward,

Okla., has a growing season slightly over 100 days, is 32 in. high, does not lodge, yields well, and threshes easily, but is susceptible to chinch bug injury.

Combine sorghums yield well on properly prepared good soil, especially on fallow or well-prepared barley-, wheat-, or corn-land. Blank listing in the fall, throwing in when weeds first appear in the spring, and additional tillage for weeds with the one-way or spring-tooth harrow once or twice before planting constitute the best method of preparing land.

Good results were had by planting with lister or loose-ground lister-planter at 3 to 5 lb. per acre in 42 in. rows, or 5 to 7 lb. with the deep-furrow drill or common drill in 14 in. rows, and during the first week in June. Cultivation is largely accomplished by completely destroying weeds while preparing the seed bed. Combine sorghums should not be harvested until the grain is dry enough to keep in a grain bin, i.e., containing not more than 13.5 percent moisture.

Effects of inoculation and liming on soybeans grown on the Grundy silt loam, R. H. WALKER and P. E. BROWN (*Iowa Sta. Bul. 298 (1933), pp. 277-296, figs. 11*).—Experiments to determine the effects of liming and inoculation on the yield and quality of soybeans grown on typical Grundy silt loam were made near Osceola in Clarke County. Different plats received from 1 to 6 tons per acre of quarry-run limestone; 20-, 40-, and 100-mesh sieved limestone (3 tons); and hydrated lime equivalent to 3 tons of quarry-run limestone.

Soybean (Manchu) plants on the inoculated half of each plat were well-supplied with nodules of nitrogen-fixing bacteria, and grew much more vigorously and appeared healthier than the uninoculated plants, which showed practically no nodules. Inoculation increased the number of pods per plant twofold and fourfold in certain cases. The hay yield was nearly doubled and the seed yield tripled because of the combination of liming and inoculation, and the protein percentage in the hay was practically doubled and in the seed increased about one third. Inoculation alone always had a greater effect than lime treatments alone, although best results came when the two treatments were combined. For best results with soybeans on this soil, the seed should be inoculated and the soil limed.

The liming studies indicated that limestone of good quality should be applied to acid soils, Grundy silt loam, or similar soils on which soybeans are to be grown. Preferably it should be 90 percent or higher in carbonate content, ground to at least 60 percent dust, and, if possible, applied at least a year before the legume is planted, although some benefit may be derived from limestone applied just before planting. It should be applied in amounts indicated as necessary by the lime requirement test.

Proceedings of the Fourth Congress of the International Society of Sugar Cane Technologists, held at San Juan, Puerto Rico, March 1st-16th, 1932, edited by J. BAGUÉ (*San Juan: House Represent. Puerto Rico, 1932, pp. XV+174+[969], pls. 17, figs. 330*).—The sessions of this Congress comprised general and sectional meetings dealing with diseases, cultural and field practices, varieties, factory operation and chemical control, and insect pests.

Papers of special interest to agronomists included *The Varietal Revolution in Puerto Rico*, by C. E. Chardon (pp. 23-31); *Sugar-Cane Growing in Puerto Rico*, by F. A. López Domínguez (pp. 35-42); *Soil Classification*, by C. F. Marbut (pp. 43-48); *Cultivation of Ratoons in Hawaii*, by W. W. G. Moir (Bul. 9, pp. 3); *Cultivation Experiments with Sugar Cane—I, The Effect of Type of Preparatory Tillage on Yield of Plant Canes*, by P. E. Turner (Bul. 15, pp. 7); *Report on Agricultural Practice in the South African Sugar Industry*, by H. H. Dodds

(Bul. 120, pp. 8) ; Notes on the Sugar Industry of Puerto Rico—I, Practices Common to the Northern, Eastern, and Central Region, by R. C. McConnie and L. de Celis (Bul. 86, pp. 1-36), and II, The Cultivation of Sugar Cane in the South Side of the Island of Puerto Rico, by M. Obén (Bul. 86, pp. 37-62) ; Brief Historical Review of Sugar-Cane Fertilization in Porto Rico, by I. A. Colón (Bul. 83, pp. 7) ; Molasses as a Fertilizer, by H. W. Kerr (Bul. 56, pp. 2) ; A Preliminary Study on the Optimum Reaction of the Nutrient Medium for Sugar Cane (Bul. 12, pp. 6) and Ammonium Versus Nitrate as Nitrogen Sources for the Sugar Cane (Bul. 13, pp. 16), both by J. H. Pardo ; Co-operative Fertilizer Experiments with P.O.J. Canes in Louisiana—a Summary of Four Years' Results, by A. H. Rosenfeld (Bul. 95, pp. 6) ; Manurial Experiments with Sugar Cane—I, Burying Versus Non-burying of Sulphate of Ammonia in Relation to Its Effect on the Yield of First Ratoon Canes (Bul. 14, pp. 5), and II, A Comparison of the Effect of Pen Manure and Single and Double Applications of Sulphate of Ammonia, Nitrate of Soda, and Nitrolim on the Yield of First Ratoon Canes (Bul. 16, pp. 7), both by P. E. Turner ; Soil Types in Relation to Sugar Cane in Cuba, by H. H. Bennett (Bul. 77, pp. 8) ; Some Aspects of Cane-Soil Surveying (Bul. 63, pp. 6) and The Significance of the Soil Profile in Cane-Field Studies (Bul. 64, pp. 5), both by F. Hardy ; Genetic Soil Classification and Mapping of the Sugar-Cane Soils in Java, by V. J. Koningsberger, E. C. J. Mohr, and G. A. Neeb (Bul. 57, pp. 8) ; Sugar-Cane Soils of Puerto Rico, by R. C. Roberts (Bul. 93, pp. 6) ; Publications Relating to Sugar-Cane Soil Investigations (Covering Approximately 1920-1930), compiled by O. Schreiner and R. B. Deemer (Bul. 124, pp. 36) ; Report of the Committee on Soils, by O. Schreiner (Bul. 127, pp. 3) ; A Comparison of the Methods of Soil Classification as Used in Different Sugar-Cane Growing Countries, by J. Thorp and R. Fernández García (Bul. 90, pp. 16) ; Soil Research in Mauritius, by N. Craig (Bul. 76, pp. 1-3), including Layout of Manurial Experiments for Estates, by A. G. Hill (Bul. 76, pp. 4-6) ; Report on Soil Work in Australia, by H. W. Kerr (Bul. 107, p. 1) ; Sugar-Cane Soil and Fertilizer Research in Peru, by F. A. López Domínguez (Bul. 78, pp. 17) ; Hawaiian Soils and Fertilizer Research, by W. W. G. Moir (Bul. 94, pp. 9) ; Report on Soil Work from Egypt, by R. Roche (Bul. 109, pp. 2) ; Soil Research in the Sugar-Cane District of Louisiana, by O. Schreiner, A. M. O'Neal, and L. A. Hurst (Bul. 106, pp. 16) ; Soil Research in Fiji Islands, by J. Trivett (Bul. 108, pp. 2) ; The Use of Less Common Elements as Soil Amendments for Sugar-Cane Production in South Florida, by R. V. Allison (Bul. 112, pp. 16) ; Experiments with the Schreiner Triangle Method in Cuba, by C. E. Beauchamp and F. Poey (Bul. 99, pp. 6) ; Analysis of Soil, by M. Bird (Bul. 75, pp. 2) ; Preliminary Microbiological Studies in Certain Soils of the San Juan Area, Puerto Rico, by J. A. Bonnet (Bul. 58, pp. 6) ; The Triangle System of Fertilizer Experiments as Applied to Sugar Cane, by R. Fernández García (Bul. 89, pp. 7) ; Colorimetric Method for Determining the Hydrogen Ion Concentration of Soils, by H. W. Kerr and N. J. King (Bul. 110, pp. 3) ; Some Problems Connected with Phosphate Fertilization, by W. T. McGeorge (Bul. 111, pp. 2) ; Methods of Correcting for Correlated Variations in Field Experiments, by G. Arceneaux (Bul. 47, pp. 6) ; Plot Size and Replications for Field Experiments with Unirrigated Sugar Cane, by R. J. Borden (Bul. 10, pp. 4) ; Limitations of the Theoretical Check Yield Method for Laying Out and Interpreting Results of Field Experiments with Sugar Cane, by F. Chardon (Bul. 82, pp. 5) ; Plot Technique (Bul. 53, pp. 4) and Field Sampling (Bul. 55, pp. 6), both by H. W. Kerr ; Border Effect in Field Experiments, by E. E. Naquin (Bul. 11, pp. 8) ; Manurial Experiments with Sugar Cane—III, An Analysis of an Estate Experiment to Determine the Effect of Sulphate of Potash on Yield

of Sugar Cane (Plant Canes) with Special Reference to the Design of Layout, by P. E. Turner (Bul. 17, pp. 5); Report of the Standing Committee on Description and Identification of the Original Cane Varieties, by W. W. G. Moir et al. (Bul. 6, pp. 6); The Native Hawaiian Canes (Bul. 7, pp. 8) and Cane Varieties or Mutations? (Bul. 8, pp. 5), both by W. W. G. Moir; Sugar-Cane Varieties in Peru, by F. A. López Domínguez (Bul. 71, pp. 22); The Production and Experimental Testing of New Varieties of Sugar Cane in Porto Rico, by R. Richardson Kuntz (Bul. 41, pp. 12); On the Somatic Chromosome Numbers of Sugar-Cane Forms and the Chromosome Numbers of Indigenous Indian Canes, by G. Bremer (Bul. 20, pp. 3); Field Trial of Co. 290, P.O.J. 2714, and P.O.J. 2725 with Uba (Bul. 118, pp. 2) and A Field Trial of Certain Coimbatore Canes in Comparison with Uba (Bul. 119, pp. 2), both by H. H. Dodds; Experiences with Cane Varieties in the Island of Cuba, by R. Menéndez Ramos (Bul. 68, pp. 23+4); Sugar-Cane Breeding in Different Countries (Being Replies to Questionnaire from Java, Mauritius, Porto Rico, Peru, Philippines, Australia, Florida, and India, Analysed and Arranged), by T. S. Venkatraman (Bul. 44, pp. 34); Some Notes on Selection of Cane Seedlings in the Early Stages of the First Year, by T. Bregger (Bul. 40, pp. 3); Sugar-Cane Crosses with Kassoer Sells, by R. L. Davis (Bul. 18, pp. 8); Sugarcane-Seedling Mosaic Elimination, by R. L. Davis (Bul. 19, pp. 17); Methods of Preserving and Describing Sugarcane Material in Taxonomic Studies, by H. B. Cowgill (Bul. 45, pp. 6); and Brief Note on Sugar Cane-Sorghum Hybrids, by T. S. Venkatraman and R. Thomas (Bul. 67, pp. 8).

The interests of the chemist and factory technologist were considered in papers entitled The Development of Sugar House Machinery and Methods of Manufacture in Puerto Rico during the Last Quarter Century, by M. A. del Valle (pp. 31-35); The Process Used in the Manufacture of Snow White Sugar at Central Mercedita, by J. R. Junghans (pp. 49-53); The Control of the Sugar Mill, by H. Schreiber (Bul. 105, pp. 2); Boilers, Furnaces, Steam, and Fuel Economy, by E. C. von Pritzelwitz van der Horst (Bul. 80, pp. 4); Electric Mill Drive, by J. J. W. Den Haan (Bul. 79, pp. 12); Recent Progress in Evaporation, as Exemplified in the Performance of the Clewiston Sugar Factory, by A. L. Webre (Bul. 54, pp. 10); Filtration of Cane Sugar Juices, by W. A. Powe (Bul. 103, pp. 9); Sulfitation Processes Employed in Sugar Factories in Egypt, by P. Neuville (Bul. 65, pp. 3); A Suggested Practical Method for Measuring Molasses Exhaustion, by J. G. Davies (Bul. 121, pp. 13); The Fermentation of Final Molasses, by H. E. Cruz Monclova (Bul. 70, pp. 7); and Clarification and Separation of Muds, by E. D. Westly (Bul. 61, pp. 5). A symposium on crystallization comprised the following papers: The Scientific Control of Pan Boiling, by S. J. Saint (Bul. 81, pp. 3); Controlling Methods in the Crystallization Process, by P. Honig (Bul. 96, pp. 6); Contributions to the Study of Crystallization of Saccharose, by K. Sandera (Bul. 62, pp. 5); The Crystallography of Sucrose, by F. P. Phelps (Bul. 104, pp. 27); X-Rays and Sugar, by G. L. Clark (Bul. 97, pp. 5); Relationship between Pan Boiling Operations and Quality of Raw Cane Sugar, by J. C. Keane and E. K. Ventre (Bul. 23, pp. 7); The Influence of Conditions during Boiling on the Composition of the Sugar Crystal as Reflected by Filtration Rate, by H. F. Bomonti (Bul. 51, pp. 6); Determination of the Saturation Temperature of Sucrose Solutions and Its Use in Finding Coefficients of Saturation and of Supersaturation, by R. W. Harman (Bul. 98, pp. 8); A Comparative Study of the Boiling Methods in the Sugar Mills of Peru, by R. Neumann (Bul. 69, pp. 6); Rapid Crystallization of Masecutes with Special Reference to the Werkspoor Crystallizer, by R. G. W. Farnell (Bul. 129, pp. 17); and another on factory control included The Comparison of Cane Milling Results (Bul. 1, pp. 2) and On "Available

Sugar" and the Expression of the Boiling House Result (Bul. 2, pp. 2), both by N. Deerr; and Report of the Special Committee on Uniformity in Reporting Factory Data, by F. W. Zerban (Bul. 125, pp. 26).

Tobacco Substation at Windsor, report for 1932, T. R. SWANBACK, O. E. STREET, and P. J. ANDERSON (*Connecticut State Sta. Bul. 350 (1933)*, pp. 461–507, pl. 1, figs. 9).—Reports are made on several experiments with cigar leaf tobacco (E.S.R., 67, p. 383), including notes on tobacco insects in 1932 by D. S. Lacroix (see page 550).

How much magnesia should be applied to tobacco land? (pp. 466–473).—Magnesium lime (30 percent MgO) was applied to adjacent plats of tobacco at rates of 100, 200, 400, and 600 lb. per acre, and the results of burn tests were correlated with magnesia content of the leaf. Magnesia increased the yield and grading, but differences between the several rates were not significant. The optimum content of magnesia seemed to be about 1.5 to 2 percent of the moisture-free weight of the cured leaf. When the percentage is lower, combustion is not so complete, and a dark ash and a less desirable taste and aroma result. With 2.5 percent or more the ash is whiter, but flakes too much. The 100-lb. rate came nearest to keeping the magnesia content of the leaf at the desired percentage during the first season. The best practice would seem to be to apply each year not more than 100 lb.

The relation of calcium to the growth of tobacco (pp. 473–478).—Greenhouse tests with Havana seed tobacco did not show deficiency symptoms when the percentage of CaO exceeded 2. There were indications that about 5 percent CaO in the air-dry leaf corresponds to optimum growth. Experiments with gypsum and with pure calcium carbonate indicated that the CaO content of the leaf increases somewhat in proportion to the lime material added to the soil. In pot tests on a rather acid soil (4.38 pH), receiving pure calcium carbonate at rates of 1 and 2 tons per acre, and ordinary tobacco fertilizer, three crops were grown. Enough lime was added to bring the reaction up to the same level for the second as for the first crop, while the third received no more lime. Wherever the calcium percentage rose the magnesium and potassium were correspondingly lowered; where the calcium content was considerably lower as in the third crop, the percentage of potassium rose to a higher level. Other experiments indicated that sodium and ammonium, to a certain extent, have a depressing effect on the absorption of calcium.

In comparisons in both sand and water cultures, different calcium compounds varied considerably in availability. Calcium nitrate produced the highest percentage of CaO in the leaf, 5.07, nitrate and sulfate (gypsum) in combination 4.96, sulfate 3.55, oxide 3.53, acetate 3.3, carbonate 3.19, oxalate 2.68, monophosphate 2.46, tartrate 2.19, no calcium salt 2, triphosphate 1.92, and calcium citrate 0.56 percent.

That calcium as a nutrient is responsible for increase in growth was shown in field and in greenhouse experiments. Other research indicated that its activity is governed by the amount of magnesia present, and vice versa. Recent studies suggested the possibility that insufficient absorption of calcium by the plant may be the ultimate cause of brown root rot. The need for calcium, as well as for other nutrients, should be considered in fertilizing Connecticut tobacco soils.

Further experiments with Nitrophoska (pp. 478, 479).—In comparative tests during 3 years, Nitrophoska appeared to consistently produce tobacco of lower grading than did the standard fertilizer formula. A tendency toward lower yields through the use of this material was also noted.

Broadleaf fertilizer experiments, J. S. Owens (pp. 479–481).—In cooperative tests on Merrimac soil, variations in nitrogen sources or rates of applying

phosphorus made only small differences in yield or quality of Broadleaf tobacco, all treatments making good crops.

Conservation of plant nutrients by cover crops, M. F. Morgan and O. E. Street (pp. 482-488).—The amounts of each nutrient actually saved by cover crops were studied in lysimeters during two seasons. Growth of cover crops affected significantly the quantity of water leached during the fall and early winter period. Oats evidently withdrew more water from the soil than either rye or timothy during its short period of active growth. Soil under an oats cover crop in 1931 contained about 16 lb. of nitrate nitrogen per acre, while that from an adjacent plat without cover* had 81 lb. Analyses of drainage water showed the acreage conservation by oats to amount to 55.7 lb. of nitrogen, calcium 44.1, potassium 23.6, and magnesium 8.1 lb. Rye conserved the nutrients to about the same degree, while timothy was much less effective. There were no consistent differences in the amounts of other elements leached as a result of cover cropping.

Comparative studies of fuels for curing in 1932 (pp. 499-502).—Comparative tests conducted in shed compartments showed that lump charcoal had the highest consumption, but maintained the highest average temperature. Eastman Charkets had the lowest consumption and the second highest gain in temperature, while Ford Briquets, about as efficient in fuel consumption as Charkets, was lowest in average temperature maintained. These two processed charcoals were much superior to lump charcoal in ease of management of fires, and they greatly reduced the fire hazard. As shown in the grade indexes of the cured tobacco, lump charcoal was distinctly inferior to the processed fuels which were similar.

Shade curing experiments in 1932 (pp. 502-507).—Curing experiments in sheds under controlled conditions showed that an initial firing period varying from 48 to 106 hours at 90° F. was necessary with the 1932 crop. The need of terminating firing when leaves tend to become brittle and the value of fires after the first firing period were indicated. The humidifying equipment in the shed permitted more rapid cure of the tobacco by supplying moisture for chemical activity. More uniform distribution of colors was found on the cured tobacco from the humidified shed, but the difference was not apparent after sweating. Fleshy midribs were not as common in the curing tobacco, but no difference in prominence of veins of the sweated tobacco was noted. Tobacco did not absorb moisture from the air when the relative humidity was below 75 percent. Tobacco hung in the peaks of sheds was inferior to that placed in the body of the shed.

The effects of nonbeneficial nodule bacteria on Austrian winter pea, L. T. LEONARD and W. R. DODSON (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 7, pp. 649-663, figs. 5).—Cultures of nodule bacteria from poor and vigorous Austrian winter peas from Jeanerette, La., were compared with nodule bacteria from closely related legumes in field and greenhouse tests. Drainage obtained by ridging the soil had but little effect, and lime and basic slag had practically no effect on the crop. Austrian winter peas treated with efficient nodule bacteria in soil known to contain inefficient nodule-producing organisms made a favorable well-defined return in quantity and quality of crop. There was evidence that the nodule organisms of the Louisiana vetch (*Vicia ludoviciana*) reduce the yield of Austrian winter pea, due to their unadaptability to this host.

Commercial agricultural seeds, 1932, J. M. BARTLETT ET AL. (*Maine Sta. Off. Insp.* 146 (1932), pp. 97-129).—The germination, purity, weed seed content, and in the case of legumes hard seed percentage are tabulated for 219 samples of agricultural seed collected from dealers in Maine in 1932.

Maryland seed laws and regulations, F. S. HOLMES (*Maryland Sta. Bul.* 343 (1933), pp. 423-433).—The text of the Maryland agricultural seed law is set forth with rules and regulations, and the texts of other Maryland seed laws are also included.

The use of arsenical compounds in the control of deep-rooted perennial weeds, A. S. CRAFTS (*Hilgardia [California Sta.]*, 7 (1933), No. 9, pp. 361-372).—Further experiments (E.S.R., 65, p. 533) on the control of wild morning-glory (*Convolvulus arvensis*) are reported, and a mechanism, dependent upon a water deficit in the plant, is described to account for the movement of arsenicals from sprayed foliage into the underground root system. Indications were that alkali mallow (*Sida hederacea*) and Russian knapweed (*Centaurea repens*) were equally susceptible to the type of treatment.

The most dilute arsenical solution giving effective control in field plats contained 0.5 percent As_2O_3 by weight, but concentrations on up to 4 percent evidently were not more effective. An arsenical spray solution of acid reaction seemed most effective in the field, the minimum effective acid concentration being about 1.0 N, and from late afternoon until midnight appeared to be the best time to use this type of spray. For best results the soil should not be excessively moist, and the foliage should be fully developed. Watering the dead foliage the morning after arsenical spraying increased the percentage of kill.

Stock arsenical solution is prepared by mixing dry 4 parts by weight of As_2O_3 and 1 part of NaOH, adding 3 parts by weight of water and stirring until dissolved. To make the spray solution, 1 part by weight of the stock solution is diluted with 100 parts of water, mixing thoroughly, and then adding, with constant stirring, 5 parts of concentrated H_2SO_4 . About 500 gal. of spray solution will be needed per acre of morning-glory and more for weeds having more abundant top growth. A nozzle giving a fan-shaped spray, operating at 100 lb. pressure, proved satisfactory. Seedlings coming up after irrigation or during the spring after spraying on unirrigated land should be killed by cultivation or spraying.

HORTICULTURE

[Horticulture and forestry at the Nebraska Station] (*Nebraska Sta. Rpt.* [1932], pp. 15-19, 39, 40).—Brief reports are presented on the results of pruning experiments with apples; on orchard soil management trials; on varietal and cultural tests with vegetables; on fruit stock investigations; on spraying experiments; and on the effect of packing and storage methods on the keeping quality of apples. In addition there are noted the results of pine tree planting trials at North Platte.

[Horticulture in the Virgin Islands], C. L. HORN and W. M. PERRY (*Virgin Islands Sta. Rpt.* 1932, pp. 11-13, 14, 18, 19, fig. 1).—Brief comments are presented on the results of trials with cashew nuts, pineapples, papayas, beans, watermelons, okra, onions, tomatoes, ornamentals, pyrethrum, cubé, and derris, and on the preservation of native fruits.

Insecticides and fungicides, 1932, J. M. BARTLETT ET AL. (*Maine Sta. Off. Insp.* 146 (1932), pp. 130-140).—The results are presented of the analyses of 92 samples of insecticides and fungicides collected by the commissioner of agriculture in 1932. The guaranties for insecticides and fungicides are briefly discussed.

Lime for spraying purposes, W. C. DUTTON (*Michigan Sta. Quart. Bul.*, 15 (1933), No. 4, pp. 268-271).—Briefly discussing the manufacture of commercial lime, the author states that only two forms, quick lime and hydrated, are

valuable in the preparation of sprays. There are, however, several forms of these limes which are not useful as spraying material because of their coarseness or high grit content.

Soil management experiments with vegetables, H. O. WERNER (*Nebraska Sta. Bul.* 278 (1933), pp. 44, figs. 7).—In comparisons of surface scraping with cultivation plant growth differed but slightly, with yields from the scraped plats equal to or greater than those of the cultivated areas in 24 of 35 trials without irrigation and in 18 of 35 trials with irrigation. Soil that was scraped and irrigated apparently was inadequately supplied with air.

Straw mulch tended to increase the moisture in the soil, lower the temperature, and decrease the nitrate content of the soil and incidentally retard the early development of all vegetables. However, the total yields were generally increased above those of the cultivated plats. Straw mulch was peculiarly effective in improving quality, especially of potatoes, in which the cooking quality was appreciably better.

Paper mulch was found valuable in hastening early production of certain vegetables, but because of the expense of the paper and the cost of placement the benefits were not sufficient to justify its use with most of the crops tested. Irrigation was the most certain of all treatments in increasing yield, and also stimulated early production and improved decidedly the market quality of the products.

Attempts to increase the nitrate content of the soil beneath straw mulch by applying nitrate of soda were successful in the spring, but by midsummer no marked differences were noticeable. The only crops to respond consistently to nitrate of soda were eggplants, lima beans, cabbage, and cauliflower.

An examination of the root system of plants under the several types of cultivation showed marked differences. The feeding roots were most abundant in straw mulch areas, intermediate in the paper mulch areas, and least in the clean cultivated plats. A marked downward tendency was noticeable for roots in the cultivated soils.

Autumn v. winter sowing of cabbage [trans. title], L. FALKOWSKI (*Pam. Państw. Inst. Nauk. Gosp. Wiejsk. Puławach* (*Mém. Inst. Natl. Polon. Écon. Rurale Puławy*), 12 (1931), No. 2, pp. 519–541; *Fr. abs.*, pp. 539–541).—Fall-sown cabbages of two varieties, Czerwcowka and Titherna, developed 1.1 and 8.2 percent of immature flower heads, respectively, as compared with 26 percent for the same varieties sown in the spring. Autumn seeding hastened the date of harvest by 10 days and increased the number of marketable heads and the total weight of the crop, and under the conditions of the experiment increased profitable returns. The occurrence of a number of large soft heads in the fall-seeded group was noted, with the comment that an effort will be made to eliminate these undesirable phenotypes by selection.

Hybridization experiments with *Solanum lycopersicum* and *S. racemigerum* [trans. title], J. HACKBARTH, N. LOSCHAKOWA-HASENBUSCH, and R. v. SENGBUSCH (*Züchter*, 5 (1933), No. 5, pp. 97–105, figs. 13).—Observing that the small-fruited *S. racemigerum* ripens its fruits from 8 to 14 days earlier than cultivated tomatoes, crosses were made at the Kaiser Wilhelm Institute, Müncheberg, in an attempt to develop early maturing varieties. There appeared in the F_2 generation many early ripening seedlings but very few that were both early maturing and bore large fruits. Size seemed to depend on a multiple factor basis. Since flowering in *S. racemigerum* commenced about 14 days earlier than in cultivated tomatoes, such as Bonny Best, and since fruit ripening was also 14 days earlier, there was evidently a strong positive correlation between time of flowering and time of maturity. A similar positive cor-

relation was noted between ovary size and the weight of mature fruits, thus making possible a selection of early-ripening, large-fruited tomatoes in the early stages of blossoming.

Stock and scion relationships in fruit trees [trans. title], G. HAFEKOST (*Gartenbauwissenschaft*, 7 (1933), No. 3, pp. 382-398, fig. 1; *Eng. abs.*, pp. 396-398).—In experiments carried out at the East Malling Research Station non-lignified shoots with two or three leaves attached were placed in sugar solutions of different concentrations, and the point at which the shoots remained fresh and unwilted after 24 hours was designated as the wilting limit. Similar shoots were suspended in the laboratory and their loss in weight in one half hour determined. Checking both sets of data with known growth rates, striking relationships were noted; vigorous types of stock possessed the higher wilting limits and the higher intensities of transpiration. Furthermore, the vigorous apple stocks were able without difficulty to impress these properties upon the scion, but in the case of the quince strong growing stocks were found generally unsuitable as roots for pear.

Select orchard sites on fertile soils, avoiding frost pockets, N. L. PARTIDGE and J. O. VEATCH (*Michigan Sta. Quart. Bul.*, 15 (1933), No. 4, pp. 248-250, figs. 2).—Observations in various sections of Michigan showed a marked correlation between the type of soil and the character of the orchard growing thereon. Growth was poorest on eroded hillsides, intermediate on fairly level uplands, and best at the foot of slopes where there had been an accumulation of wash. However, the relative freedom from local frosts on the uplands more than counterbalanced in most cases the lower fertility. Deep, dry sands as a rule did not equal friable loams or sandy soils underlain by clay.

Loss of oil from orchard heaters while standing, E. R. PARKER (*Calif. Citrogr.*, 18 (1933), No. 6, pp. 163, 184, figs. 3).—Observing a loss of oil from standing orchard heaters and that such loss varied apparently according to the cleanliness of the heater, measurements were made at the Citrus Experiment Station, Riverside, of the oil loss under different conditions. The maximum loss occurred in heaters classed as burned and dirty inside and out and resting on soil. Burned heaters which had been cleaned inside and out lost much less oil, and the least loss of all was in the case of clean heaters which had not been fired. It was apparent that oil loss was due to capillarity over the sides rather than to condensation of vaporized components of the oil.

Where heaters were placed against the base of trees in summer to get them out of the way of orchard operations clear-cut evidence of injury to the tree itself was manifested, both by direct absorption of oil from the rim of the heater and from oil seeped into the adjacent soil.

Practical tree surgery with a short course in apple culture, V. T. HANSON (*Appleton, Wis.: C. C. Nelson Pub. Co.*, 1932, pp. XV+101, figs. 45).—A book of practical information concerning the care of trees.

Pruning studies with the apple [trans. title], R. WATANABE (*Res. Bul. Agr. Expt. Sta. So. Manchuria Ry. Co.*, No. 9 (1933), pp. 31, pls. 4, figs. 5; *Eng. abs.*, pp. 27-31).—Where the limbs of apple trees were separated into their component types of growth, there was observed in many instances definite weight relationships between the main branch and its twigs and leaves. In summer the weight balance between groups of shoots and twigs gradually changed under the influence of increasing weight of leaves. Those fruit spurs and shoots which had the higher leaf ratio were also most vigorous.

Xenia and metaxenia in the apple [trans. title], G. KRUMBHOLZ (*Gartenbauwissenschaft*, 6 (1932), No. 4, pp. 404-424, fig. 1).—At Geisenheim, Germany, three apples of the Reinette type were crossed with various other varieties and the resulting fruits carefully examined for indications of xenia or

metaxenia. In no case were xenia effects observed in the seeds, nor were externally evident signs of metaxenia observed in the fruits. It is pointed out that even with equal seed contents fruits of a single tree may vary greatly, irrespective of the pollen parents. In the case of all three of the ovule parents Baumann Reinette pollen produced the largest fruits, with Kaiser Alexander on the other extreme. Of 174 blooms of Canada Reinette pollinated with Winter Calville none produced a fruit, but whether the two varieties are intersterile or not one year's results are not conceded sufficient for conclusions. The Canada Reinette proved fully self-unfruitful.

The influence of soil moisture differences on apple fruit color and condition of the tree, D. A. KIMBALL (*Sci. Agr.*, 13 (1933), No. 9, pp. 566-575, figs. 4).—A marked correlation between fruit color and soil moisture and very little relation between fruit color and fertilizer treatment were observed at the Ontario Agricultural College in a block of 380 apple trees planted on a level and apparently uniform area of 8.68 acres. Soil borings to a depth of 11.5 ft. revealed sharp differences in the depth of the top sandy silt layer. To a point of 6 to 7 ft. the soil was uniform in structure and moisture content, but where the subsoil of clay or clay and sand was contacted the percentage of moisture rose from a level of 2 to 5 percent to 12 to 20 percent. Rows of trees located on soil in which the high moisture layer was nearer the surface produced better colored apples. However, growth, as measured by trunk increment, and also yields were not influenced significantly. The only fertilizer influence on color was a slight reduction in color associated with applications of nitrogen, but this effect was not considered primary but rather contributory to a fundamental soil relationship.

The apple, A. D. HALL and M. B. CRANE (*London: Martin Hopkinson*, 1933, pp. 235, pls. 12, figs. 11).—Prepared primarily for the English orchardist, considerable information of universal value and well supported by experimental evidence is presented on the botany of the apple, pollination requirements, breeding results, propagation, etc.

Time and methods for harvesting Royal Ann cherries for barreling, E. H. WIEGAND (*Oreg. State Hort. Soc. Ann. Rpt.*, 24 (1932), pp. 24-27).—Studies at the Oregon Experiment Station indicated that cherries harvested for blanching should be picked at a much earlier stage than is commonly practiced for canning material. With fully ripe cherries there was noted a tendency, because of high sugar content, to absorb water by osmosis and for the fruit to crack. On any given tree, fruit carried on lightly loaded branches tended to ripen earlier than that on heavily loaded branches. Cherries ranging from 16 to 18 percent of soluble solids, as indicated by a hydrometer with a Balling scale, were found more satisfactory for maraschino purposes than cherries above 18 percent.

Preparing peaches for market, J. W. PARK (*U.S. Dept. Agr., Farmers' Bul.* 1702 (1933), pp. II+33, figs. 26).—This, a revision of Farmers' Bulletin 1266 (E.S.R., 47, p. 239), presents information on harvesting, grading, packing, packing house operations, packages, loading of cars, storage, etc.

Establishing a strawberry planting, J. H. CLARK (*New Jersey Stas. Circ.* 281 (1933), pp. 4, fig. 1).—General information is offered on soils, desirable types of plants for setting, methods of planting, etc.

New hardy seedless grapes, A. B. STOUT (*Science*, 77 (1933), No. 1995, pp. 310, 311).—From a cooperative project between the New York Botanical Garden and the New York State Experiment Station, at Geneva, there have been derived 28 grape seedlings that bear seedless or nearly seedless fruits and are hardy in western New York. All the seedlings are progeny of hardy seeded varieties crossed with the tender seedless kinds Sultanina, Sultanina

Rosea, and Monukka. In most of the new seedless varieties there was observed some development of the tissues of the seed coats, but the embryo and endosperm were missing or occurred only as traces. Certain of the new varieties approach Concord in berry size, and the color range includes green, amber, red, mottled red, and shades of black.

Grafting tropical fruit trees in Hawaii, W. T. POPE and W. B. STOREY (*Hawaii Sta. Circ.* 6 (1933), pp. 24, figs. 5).—General information is given on the principles and practices of grafting, with special reference to the avocado, citrus, coffee, Macadamia nut, mango, litchi, and lungan.

The pollination of avocados, A. B. STOUT (*Florida Sta. Bul.* 257 (1933), pp. 44, figs. 12).—Along the lines of an earlier paper (E.S.R., 50, p. 238), the author discusses the floral behavior in the avocado and points out the direct bearing of the peculiar habit of alternate functioning of pistils and stamens on pollination. Varieties were found to separate rather sharply into two groups, (1) those whose blossoms normally open for female function in the morning and for male function in the afternoon, and (2) those which behave reciprocally. Since every clonal variety and seedling observed in either Florida or California was found to exhibit a daily synchronous alternation of dichogamy which limited or restricted close or self-pollination, interplanting of varieties belonging to both groups is considered desirable, and plans for such plantings are set forth. The presence of an abundant population of honeybees is also deemed advisable. It is conceded possible that in time a group of varieties may be bred or discovered which will be fully self-fruitful, but until that time it is recommended that interplanting be carried out on the basis of floral behavior.

The investigations were carried on cooperatively by the Florida Station, the New York Botanical Garden, the University of Miami, and Dade County.

Puerto Rico seedless orange selections, A. D. SHAMEL and E. H. TWIGHT (*Jour. Dept. Agr. Puerto Rico*, 17 (1933), No. 2, pp. 171-181, pls. 4).—Accompanying a general discussion there are presented descriptions of four orange trees and their fruit discovered by the authors and others in a survey of the seedling orchards of the island. Because of the scarcity of high quality seedless oranges and the desirable characteristics of the new selections they are considered highly promising.

Lilacs in my garden, A. HARDING (*New York: Macmillan Co.*, 1933, pp. X+88, pls. 7).—A popular discussion of varieties, propagation, culture, etc.

The growth of *Rhododendron ponticum* in sand cultures, E. L. SPENCER and J. W. SHIVE (*Bul. Torrey Bot. Club*, 60 (1933), No. 6, pp. 423-439, figs. 3).—In this contribution from the New Jersey Experiment Stations it is reported that within certain limits *R. ponticum* was not particularly sensitive to variations in salt proportions so long as the variations did not actually involve an absolute deficiency in any of the essential elements. As measured by dry weight produced, the volume-molecular concentrations of 0.00211 KH_2PO_4 , 0.00438 $\text{Ca}(\text{NO}_3)_2$, 0.00237 MgSO_4 , and 0.0070 $(\text{NH}_4)_2\text{SO}_4$ led.

Sweet peas for all purposes, A. J. MACSELF (*London: W. H. & L. Collingridge*, [1933], pp. X+84, pls. 8, figs. 14).—A general treatise on culture, breeding, exhibition practices, and utilization.

Informal gardens, H. S. ORTLOFF (*New York: Macmillan Co.*, 1933, pp. IX+115, pls. 5, figs. 13).—This is a popular account dealing with design, plant materials, types of gardens, maintenance, etc.

The rock garden, R. FARRER (*London: T. Nelson & Sons*, [1932], pp. XI+118, pls. 8, figs. 4).—Beautifully illustrated with colored plates, this text presents information on the construction of rock gardens, cultural practices, plant materials, etc.

Shrubs and trees for the garden, A. OSBORN (*London and Melbourne: Ward, Lock & Co., 1933, pp. 576, pls. [72], figs. 30*).—Devoted principally to plant materials, information is also supplied on arrangement, culture, pruning, propagation, control of pests, etc.

The cultivated conifers in North America, L. H. BAILEY (*New York: Macmillan Co., 1933, pp. IX+404, pls. 48, figs. 114*).—This monograph, a successor to *The Cultivated Evergreens* (E.S.R., 50, p. 240), presents technical descriptions, supplemented by discussion of various members of the pine family and the taxads.

FORESTRY

Forestry survey in the Virgin Islands, E. V. ROBERTS (*Virgin Islands Sta. Rpt. 1932, pp. 20, 21, fig. 1*).—The present status of the forests is described, with suggestions as to future improvements.

Preliminary results in eradicating weeds with zinc sulphate and by burning in forest nursery seed beds, R. H. WESTVELD (*Michigan Sta. Quart. Bul., 15 (1933), No. 4, pp. 254-261*).—Treatment of small plats of white spruce growing in the Michigan State College nursery with zinc sulfate solution immediately upon sowing or with an open flame just prior to the emergence of the forest tree seedlings gave good results in weed control. From the standpoint of weed control and of preventing damage to tree seedlings the 8-g zinc sulfate treatment and the 8 seconds of burning per square foot were the most satisfactory. Both treatments were less costly than hand weeding. Burning had no harmful effect on the soil, whereas it is believed that the continued use of zinc sulfate would tend to promote an acid soil condition. The preliminary nature of the tests is pointed out.

Germination and seedling development in *Pinus halepensis* and *Quercus coccifera* [trans. title], H. R. OPPENHEIMER (*Gartenbauwissenschaft, 7 (1933), No. 3, pp. 308-364, figs. 14*).—In this contribution from the Hebrew University of Jerusalem it is stated that the optimum temperature for germination in *P. halepensis* is 19° C., with a sharp decline at temperatures above 20°. A calcium content of 80 percent in the soil was endured by seedlings without injury, but above 85 percent there was a sharp increase in mortality. Better development of young seedlings took place in clay than in sandy soil.

In the case of the oak, excellent germination (74 to 100 percent) was obtained by November planting. The quality of the soil or the elevation above the sea had no significant influence on germination.

Making spruce-fir land profitable, R. H. WESTVELD (*Michigan Sta. Quart. Bul., 15 (1933), No. 4, pp. 261-264*).—Measurements taken in two spruce-fir stands on similar sites but differing in the amount of competing hardwoods showed that the hardwoods, aspen and paper birch, had greatly suppressed conifers. On the free plat there were 530 trees per acre large enough for pulpwood, with only 20 softwoods of this size on the suppressed area. The desirability of removing hardwoods at an early stage, between the fifth and tenth years, is stressed, with the suggestion that results at the Dunbar Forest Experiment Station had shown the advisability of removing the hardwoods in two cuttings.

Perfecting a stand-density index for even-aged forests, L. H. REINEKE (*Jour. Agr. Res. [U.S.], 46 (1933), No. 7, pp. 627-638, figs. 7*).—For even-aged stands of the same average diameter the density of stocking was found to vary directly as the number of trees per unit area. The curve of maximum number of trees per acre over average diameter is a straight line on logarithmic graph paper and was expressed as $\log N = -1.605 \log D + k$, in which N is the number of trees per acre, D is the average diameter, and k is a constant varying with

species. Curves for *Abies magnifica*, *A. concolor*, mixed-conifer types in California, *Pseudotsuga douglasi* (*taxifolia*), *Eucalyptus globulus*, *Sequoia sempervirens*, *Pinus ponderosa*, *P. contorta*, *P. palustris*, *P. taeda*, *P. strobus*, and *Chamaecyparis thyoides* conformed to this equation. *P. caribaea* diverged slightly, and *P. echinata* more definitely. The effect of age and site quality was found negligible. Stand-density index is determined by the number of trees at 10 in. diameter from the equation satisfying the average diameter and number of trees per acre of the stand. It may be determined by simple graphics.

Repairing of storm damaged trees, K. DRESSEL (*Michigan Sta. Quart. Bul.*, 15 (1933), No. 4, pp. 250-254, figs. 2).—Stating that boxelder, poplar, elm, and willow suffered severely in the ice storm of March 1933, the author stresses the need of careful treatment of resulting wounds and the removing of badly damaged branches. The best practices in cutting large branches and stubs, in treating wounds, and in bracing limbs and weakened crotches are outlined.

DISEASES OF PLANTS

Plant diseases (*Nebraska Sta. Rpt.* [1932], pp. 27-29).—Results are briefly noted of studies on the pathological and physiological aspects of alfalfa failures in Nebraska and on potato scab and *Fusarium* wilt of potato in relation to infection from the soil.

Notes on fungal diseases during the year (*Seale-Hayne Agr. Col. Pam.* 36 (1931), pp. 16-20).—These notes include information regarding observations made during 1930 as to diseases occurring on cereals, potatoes, root crops, beans, vegetables, fruit trees, and flowers.

Report of the mycologist for 1930, R. LEACH (*Nyasaland Dept. Agr. Ann. Rpt.* 1930, pp. 32-34).—The work for the year 1930 has been devoted almost entirely to investigations into the cause of and possible remedial measures for tea yellows (*Rhizoctonia bataticola*?). Mention is also made of other diseases and causal organisms, including die-back (*Stilbella theae*?), stem and branch canker (*Macrophoma theae*?, *Phoma* spp., *Macrophoma* sp., *Colletotrichum* sp., *Pestalozzia* sp., and *Glomerella* sp. giving no inoculation), and violet root disease (*Rhizoctonia* sp.? (*Helicobasidium longisporium*?)); coffee leaf rust (*Hemileia vastatrix*) and black tip; and olive wet root rot disease (*Armillaria* sp. present).

Mycology (*Punjab Dept. Agr. Rpt.* 1929-30, pt. 1, pp. 23-27).—"During the year 135 specimens of diseased plants were examined, and 14 of these are reported to be attacked by diseases which have never before been recorded in the Punjab." Diseases of wheat included loose smut (*Ustilago tritici*), bunt (*Tilletia tritici*), and earcockle (*Tylenchus scandens*); of gram included blight (*Mycosphaerella pinodes*) and *Rhizoctonia* disease (*R. napi*); of sugarcane included mosaic, to which the varieties Co. 290, Co. 285, and Co. 281 are reported as highly resistant, Katha as fairly resistant, and Co. 223 as most susceptible; and of orange included citrus canker (*Phytophthora citri*). Some protective measures are indicated as tried or recommended.

A preliminary checklist of diseases of cultivated plants in the winter rainfall area of the Cape Province, L. VERWOERD ([*Union So. Africa Dept. Agr.*], *Sci. Bul.* 88 (1929), pp. 28, figs. 2).—These diseases, indicated in connection with the hosts which are arranged alphabetically, are those affecting plants in the so-called "winter area" of the Cape Province, which area is mapped as divided into 24 constituent districts.

Standardization and relative purification technique with plant virus preparations, B. M. DUGGAR (*Soc. Expt. Biol. and Med. Proc.*, 30 (1933), No. 8,

pp. 1104-1109).—From the University of Wisconsin a method is described for the proximate purification of plant viruses whereby the elimination is effected of coarser suspension and colloidal particles, including such materials as starch, many proteins, and chlorophyll, leaving a reasonably natural environment of solutes. The procedure consists in treating the crude juice ($\frac{1}{10}$ concentration) with 10 parts by weight of supercelite, a diatomaceous product, for 30 minutes, with shaking, and then centrifuging about 5 minutes at 4,000 r.p.m. The treatment does not materially affect the concentration in virus particles or the physical properties of the extract. The removal of the coarser particles facilitates filtration and yields a virus suspension in which the properties of the virus are determinable with greater consistency.—(Courtesy Biol. Abs.)

The nature of saltation in *Fusarium* and *Helminthosporium*, S. DICKINSON (Minnesota Sta. Tech. Bul. 88 (1932), pp. 42, figs. 6).—All the numerous nuclei in the conidia of *H. pedicellatum*, *H. monoceros*, and *Helminthosporium* sp. (*Brachysporium* type) were found to originate from a single nucleus, and each cell in both the mycelium and conidia of *F. fructigenum* and *F. vasinfectum* contained one nucleus. When cells or conidia, either containing one nucleus or arising from one nucleus, were isolated, they invariably gave rise to colonies similar to those of the parent strains. After such isolation, it was found that these strains would, under appropriate conditions, give rise to saltant strains. It was, therefore, concluded that heterocaryosis is not responsible for such saltations in these species.

Fusion cells were formed between pairs of cells of two contrasting saltant strains of *F. fructigenum*. It was presumed that during the fusion cell condition the two cytoplasms were thoroughly mixed. However, on isolation from the subsequent growth of such fusion cells, the cultural characters of the two parent strains were found unchanged, indicating that the difference between such strains is not cytoplasmic. Since heterocaryosis and cytoplasmic inheritance were disproved, it was concluded that the nature of saltation in these strains of *F. fructigenum* is a change in the nucleus, i.e., a mutation.

Macrophomina phaseoli (Maub.) Ashby, in Trinidad, I, II, J. WEST and W. R. STUCKEY (Mem. Imp. Col. Trop. Agr., Trinidad, Mycol. Ser. No. 4 (1931), pp. 20, pls. 4).—This account is in two sections dealing respectively with parasitism by West (pp. 1-7), and with physiology, by Stuckey (pp. 8-20) as regards *M. phaseoli* in Trinidad, with summary, discussion, and bibliographies.

Inoculation experiments were carried out with cotton, and to a lesser extent with jute. Under normal conditions *M. phaseoli* is not a parasite, though under very moist conditions it will attack jute seedlings, and while cotton is susceptible due to growth in low soil humus it may attack that plant. Young cotton plants under controlled conditions are susceptible also for a time after defoliation, which condition can be correlated with the absence of starch in the tissues.

It is suggested that *M. phaseoli* is a facultative parasite on cotton, slightly exceeding in such activity *Diplodia* sp. It is also suggested that the parasitism of *M. phaseoli* is bound up with the physiology of the host, that is, it is dependent upon environment.

The data from the physiological studies of *M. phaseoli*, as presented in some detail with discussion, indicate that the fungus is capable of growing efficiently under a variety of environmental conditions. Substances over a wide range may be utilized by the fungus.

List of plants susceptible to mosaic and mosaic-like diseases, I. HINO (Bul. Miyazaki Col. Agr. and Forestry, No. 5 (1933), pp. 97-111; Japan. abs., p. 111).—A list of species (arranged by families) found susceptible to mosaic since publication of the list by Kunkel in 1928 (E.S.R., 60, p. 370).

Resistance of monocotyledons to *Phymatotrichum* root rot, J. J. TAUBENHAUS and W. N. EZEKIEL (*Phytopathology*, 22 (1932), No. 5, pp. 443-452, fig. 1; abs. in *Texas Sta. Circ.* 68 (1932), p. 23).—Many monocotyledonous plants were grown in field plats side by side with susceptible okra, carrot, and cotton plants and copiously inoculated with *Phymatotrichum* root rot. In the laboratory, carrot roots and onion bulbs were inoculated in moist chambers, and carrots, onions, hyacinths, cannas, and tuberoses, grown in 5-in. pots, were inoculated with sclerotia of *P. omnivorum* from pure cultures. Carrot, okra, and cotton plants always succumbed to typical root rot and the causal organism was readily recovered, while not a plant of the 16 different genera of monocotyledonous plants inoculated became infected, succumbed, or even showed traces of the strands on the roots.

Definite, dark reddish-brown lesions found on the roots of corn, sorghum, and many other graminaceous plants in these experiments and in root rot-free areas were found due to micro-organisms other than *P. omnivorum*. The monocotyledonous plants tested appeared to be neither hosts nor carriers of *Phymatotrichum* root rot.

Resistance of the Turk's-cap hibiscus, *Malvaviscus konzattii*, to *Phymatotrichum* root rot, W. J. BACH and J. J. TAUBENHAUS (*Phytopathology*, 22 (1932), No. 5, pp. 453-458, fig. 1; abs. in *Texas Sta. Circ.* 68 (1932), pp. 23, 24).—Although plants belonging to the *Malvaceae* in general have been found highly susceptible to *Phymatotrichum* root rot, Turk's-cap hibiscus appears to be an exception, as it was found to possess a very high degree of resistance. It was the only one of 82 species of *Malvaceae* studied as to relative susceptibility to *Phymatotrichum* root rot to show no infection under field conditions. Numerous attempts at artificial infection of this plant failed to cause infection and death of well-established plants.

Growth of *Phymatotrichum omnivorum* in plant juices as correlated with resistance of plants to root rot, W. N. EZEKIEL, J. J. TAUBENHAUS, and J. F. FUDGE (*Phytopathology*, 22 (1932), No. 5, pp. 459-474; abs. in *Texas Sta. Circ.* 68 (1932), p. 24).—*P. omnivorum* was grown in cultures prepared with juices expressed from monocotyledonous plants, i.e., corn, onions, cannas, and nutgrass, resistant to the disease, and from susceptible dicotyledonous plants, i.e., cotton, carrots, turnips, and sweetpotatoes. Growth of the fungus was inhibited markedly in undiluted autoclaved juices from all of the resistant plants, while profuse and heavy growth was obtained with juices from three of four susceptible plants. With diluted juices, good growth was obtained even in series from the resistant plants.

Monocotyledonous plants resistant to root rot apparently contain materials that in sufficiently high concentration can inhibit the growth of the root rot fungus, and their resistance to the disease is probably based, at least in part, on the presence of this material or materials.

Violet root rot in Texas, J. J. TAUBENHAUS (*U.S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 16 (1932), No. 7, pp. 74, 75; abs. in *Texas Sta. Circ.* 68 (1932), p. 29).—For the first time in Texas, sweetpotatoes and coralberries were found to be infected heavily with root rot (*Rhizoctonia violacea*). With sweetpotatoes the regular curing process seemed to have killed the organism.

The distribution of the genus *Phytophthora*, C. M. TUCKER (*Missouri Sta. Res. Bul.* 184 (1933), pp. 80).—This is a compilation of the published information on the occurrence of species of *Phytophthora* on cultivated and wild hosts, with notes on their geographic distribution and on the characteristic symptoms. Natural infections are reported for 216 host species representing 149 genera and 67 families. The results of artificial inoculations indicated

susceptibility to infection in 82 species representing 45 genera and 6 families, in addition to those in which natural infection was observed. In general the authors' nomenclature of species of *Phytophthora* is retained, except when the nonvalidity of such names was clearly established. A page index of hosts and a bibliography of more than 500 titles are included.

A study of diseases of canning crops (peas and corn) in Minnesota, G. H. STARR (*Minnesota Sta. Tech. Bul.* 89 (1932), pp. 51, figs. 14).—As a result of studies extending over a 5-year period, 1927–31, there is presented information on the life history and control of various economic diseases of peas and corn.

Several species of *Fusarium*, among which *F. orthoceras* was most common, were found capable of causing wilt of peas. Since certain *Fusarium* cultures sufficiently alike to be classified as a single species varied markedly in pathogenicity, acid tolerance, rate of growth, pigmentation, and spore production, it is concluded that they are distinct physiologic forms. For two *Fusarium* cultures a soil temperature of 28° C. was found associated with the largest number of wilted plants and the best growth on agar. One culture grew most rapidly at 20°. As regards soil moisture, the greatest amount of wilt developed on the wettest soil. The transmission of wilt by seed was demonstrated, and the use of wilt-resistant peas is conceded the most promising outlook.

The most common diseases of sweet corn were smut, rust, root rot, and seedling blight, and of these smut and seedling blight were the most destructive. Seed treatment of corn in some instances gave remarkable increases in stand and yield and in others no benefit. A close correlation was noted between cool, wet weather at planting and injury from seedling blight. Fertilizer had little effect on the development of seedling blight or on the results of seed treatments. Immaturity of corn seed at time of harvest and too high drying temperatures predisposed the seed to seedling blight. Organic mercury dusts used at the rate of from 2 to 3 oz. per bushel were found the most satisfactory treatment. Because of frequent occurrence of cool, wet weather at planting time it is suggested that seed treatment should be regularly practiced.

Flag smut in wheat experiments, 1930, R. B. MORWOOD (*Queensland Agr. Jour.*, 35 (1931), No. 6, pp. 363–367).—Experimentation on flag smut, initiated in 1929 and reported on as previously noted (*E. S. R.*, 68, p. 628), was carried forward in 1930 at the Roma state farm.

Of the four experiments the first failed owing to weather conditions. The remaining three confirmed and extended the results previously obtained. Specifically, copper sulfate can effectively control seed-borne flag smut without impairing germinability. Copper carbonate is not satisfactory unless the seed smut load is so small as to be invisible to the unaided eye. The same appears to be true of wheat bunt control. Hot water did not show its usual complete degree of control. It seriously reduced germination, and is considered impracticable as a control method.

Studies on foot and root rot of wheat.—I, Effect of age of the wheat plant upon the development of foot and root rot, W. C. BROADFOOT (*Canad. Jour. Res.*, 8 (1933), No. 5, pp. 483–491, fig. 1).—In studies to determine whether, in sterilized inoculated soil, Marquis wheat plants became more or less susceptible during the post-seedling stage to *Ophiobolus graminis*, *Helminthosporium sativum*, and *Fusarium culmorum*, the plants in the seedling stage proved to be more susceptible than at later stages, but there was, with the technic used, no evidence that the plants become more or less susceptible during the post-seedling stage.

In sterilized soil in open pot culture, inoculum of *O. graminis* was definitely more virulent when alone than when mixed singly or in combination with *H. sativum*, *F. culmorum*, or *Leptosphaeria herpotrichoides*. The virulence of all pathogens mentioned decreased progressively in sterilized soil, the greatest decrease taking place during the first 40 days, after which they were only slightly pathogenic, and at the end of 120 days inoculum of *O. graminis* was impotent. The virulence of inoculum when added to unsterilized soil was greatly reduced in contrast with that in sterilized soil, and after 10 days it was practically at a minimum. These results emphasize the necessity of protecting inoculated sterilized soil against contamination by other microorganisms in critical studies made in soil, and throw light on the much recognized difficulty of producing foot rot in the field by prepared inoculum added to such soil.—(Courtesy Biol. Abs.)

The relation of species of *Agropyron* and certain other grasses to the foot-rot problem of wheat in Alberta, G. W. PADWICK and A. W. HENRY (*Canad. Jour. Res.*, 8 (1933), No. 4, pp. 349–363, figs. 4).—A survey made to ascertain to what extent certain wild and cultivated grasses in Alberta are harboring fungi capable of causing foot rots of wheat showed quackgrass (*A. repens*) and western ryegrass (*A. tenerum*) to be heavily attacked under natural conditions with strains of the take-all fungus, *Ophiobolus graminis*, which proved capable of causing as severe damage to wheat as strains from wheat. Strains of *Helminthosporium sativum* which proved highly pathogenic to wheat were also isolated from these two grasses. Strains of *Fusarium* obtained from *A. repens* and *A. richardsonii* caused little or no damage to wheat.

A. repens, already an important weed in central Alberta, was found infesting cultivated fields in summer fallow as well as those in crop. In summer fallow it seems to encourage the survival of *O. graminis*, while in wheat fields infected quackgrass was found associated with severe take-all damage to the crop. *A. tenerum* occurs commonly as a wild native plant in Alberta. Observations indicate that in the moister parts of the province wheat following this grass in rotations may be severely injured by take-all. In a rotation at the University of Alberta, wheat showed little or no take-all damage after timothy and alfalfa, moderate damage after brome grass, and severe damage after western ryegrass, while western ryegrass itself was almost killed out prematurely in all replicates, apparently by the take-all fungus.

When artificial inoculation of the various grasses was made with wheat strains of foot-rotting fungi by adding inoculum to the soil, all species of *Agropyron* tested, including crested wheatgrass, *A. cristatum*, proved highly susceptible to *O. graminis*, moderately susceptible to *H. sativum*, but only slightly susceptible to *F. graminearum*, though the latter was responsible for considerable nonemergence of the seedlings. *Bromus inermis* and *B. ciliatus* proved quite susceptible to all three pathogenes. *Hordeum jubatum* was heavily attacked by *O. graminis*, but not by the other two fungi. Oats was not attacked by *O. graminis* and only slightly by *Helminthosporium sativum* and *F. graminearum*, while timothy appeared immune from all three fungi.

The reaction of alfalfa varieties to bacterial wilt, S. C. SALMON (*Jour. Amer. Soc. Agron.*, 22 (1930), No. 9, pp. 802–810).—Data from duplicated $\frac{1}{20}$ -acre plats of 15 varieties of alfalfa at Manhattan, Kans., seeded in 1922 showed in 1926 to 1928 an obvious correlation between the percentage of dead plants and infection by bacterial wilt caused by *Aplanobacter insidiosum* McCulloch. This fact taken with other circumstances leads to the opinion that the large loss of stand in some varieties was chiefly due to bacterial wilt. In experimental

fields in eastern Kansas, Grimm alfalfa was more abundantly infected by wilt than Kansas Common. Varieties most infected with bacterial wilt are not in all cases those most easily damaged by low temperature, as determined by the results of artificial freezing of 5 of the varieties.—(*Courtesy Biol. Abs.*)

The relative susceptibility of alfalfas to wilt, G. L. PELTIER (*Nebraska Sta. Res. Bul.* 66 (1933), pp. 16).—Lots of alfalfa seed, assembled from many alfalfa-growing regions of the world by H. L. Westover of the U.S. Department of Agriculture, were tested during three years for susceptibility to bacterial wilt (*Aplanobacter insidiosum*) (E.S.R., 63, p. 344; 65, p. 148; 68, p. 628), and relative ratings were assigned to the more promising kinds.

All alfalfas currently grown for commercial seed production in the United States so far tested, except Ladak and strains originating from a few old fields of Turkistan alfalfa, proved susceptible to wilt.

All seed lots tested from South America (including Chile, Argentina, and Uruguay), Europe (including France, Spain, Portugal, Germany, Hungary, Italy, Rumania, and Ukrainian S.S.R.), Africa (including Morocco, Algeria, and Ethiopia (Abyssinia)), and Asia (including Palestine, Manchuria, China, Chosen (Korea), and Chinese Turkistan) also were found to be susceptible. All seed lots of Turkistan origin so far tested were found as resistant as Hardistan, or more so. Seed samples from districts of Turkistan, ranked in order of combined wilt and cold resistance, were Khiva, Chimbai and Alma Ata, Tashkent, Samarkand, and Chardzhui. Seed from the Bukhara, Ashkhabad, and Ferghana districts, and similarly several seed lots from Persia and one from India, although wilt resistant were lacking in hardiness.

Bacterial soft rot of broccoli (*Seale-Hayne Agr. Col. Pam.* 36 (1931), pp. 24, 25).—Broccoli plants saved for seed in west Cornwall had previously suffered losses ascribed to frost, but investigation confirmed by S. G. Paine showed that the trouble was a disease due to *Bacillus carotovorus*.

Physiology of parasitism in cabbage wilt caused by *Fusarium conglutinans*, W. T. H. Ho (*Sci. Soc. China, Trans.*, 6 (1930), pp. 69–104, fig. 1).—This account of the yellows or wilt of cabbage (*Brassica oleracea capitata*) details work done with 11 organisms studied, with a somewhat detailed summary of the findings.

Yellows-resistant lines of Jersey Wakefield cabbage, J. C. WALKER (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 7, pp. 639–648, figs. 2).—Following an earlier paper (E.S.R., 63, p. 344), in which it was reported that inheritance of resistance to *Fusarium conglutinans* is apparently controlled by a single dominant Mendelian factor, further evidence is presented to suggest that homozygous resistant pure lines can be secured from commercial stocks of Jersey Wakefield. When planted on yellows infested soil these isolations continued to be completely resistant in succeeding generations. By rigid selection for type and uniformity of ripening it was found possible to combine desirable characters with resistance to the disease in question. In studying progenies resulting from self-pollination and from crossing of two resistant lines it was observed that whereas some selfed lines lost vigor from selfing others showed no detrimental effects. Certain of the more promising resistant lines are discussed and described.

Investigations on celery diseases and their control, H. H. STIRRUP and J. W. EWAN ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul.* 25 (1931), pp. VI+34, figs. 13).—The chief seedling disease of celery is said to be not a true damping-off (*Pythium debaryanum*) but a root rot working backwards from a tip infection due to *P. artotrogus*. It arises from contaminated soil. This can be disinfected by the use of a 2 percent formalin applied at the rate of from 2

to 4 pints per square foot. A disease due to *Phoma apiicola* occurs in both seedlings and adult plants, attacking just below the collar. It appears to be seed borne and partially controllable by seed treatment.

Leaf spot or blight (*Septoria apii*) is only partially controllable by soaking the seed up to 24 hours in 1 : 300 formalin. The use of homemade Bordeaux mixture is also recommended. The commercial production of celery seed free from infection with *S. apii* is said to have been accomplished. The disease-free seed, which was obtained by giving special attention to the seed plants and spraying them regularly during their two years' growth, gave healthy plants.

Early blight threatens Michigan 1933 celery crop, R. NELSON and L. C. COCHRAN (*Michigan Sta. Quart. Bul.*, 15 (1933), No. 4, pp. 294-298, figs. 3).—Because of extensive outbreaks of the disease in 1932 and its habit of overwintering in old trash in the field, damage is said to await the 1933 celery crop. Early blight is destructive only to summer celery because of the high temperature requirements of the organism. Timely and repeated treatment with Bordeaux mixture and copper-lime dust are said to give satisfactory control, and it is advised that the applying of irrigation water be confined to the morning.

The germination of seed corn and its relation to the occurrence of molds during germination, A. N. HUME and C. J. FRANZKE (*South Dakota Sta. Bul.* 275 (1933), pp. 19, figs. 7).—Germination tests with rag-doll testers on seed corn secured in 1924 from 24 localities in South Dakota showed percentages of mold to range from 12.5 to 74.6 percent. Data covering several years showed a definite tendency for ears with the highest germination percentage to develop the lowest percentage of moldy kernels, and vice versa. Indications were that the development of mold on corn kernels may be affected by seasonal conditions, but in each season considered there was some negative correlation between germination and mold on the kernels. The value of mold-free seed corn was evident. The rag-doll germination method is described, and the characteristics of certain corn rot diseases are abstracted from Illinois Station Bulletin 255 (E.S.R., 52, p. 245).

The influence of date of planting cotton on the development of root-rot, B. F. DANA, H. E. REA, and H. DUNLAVY (*Jour. Amer. Soc. Agron.*, 24 (1932), No. 5, pp. 367-377, figs. 3; abs. in *Texas Sta. Circ.* 68 (1932), p. 22).—When several upland cotton varieties were planted at several dates on Houston black and Houston clay soils infected with cotton root rot (*Phymatotrichum omnivorum*), root rot appeared at nearly the same time in the early and midseason plantings, indicating that there was a strong factor influencing the time of first appearance of the disease, and that this factor was not the age of the host plant. Previous studies indicated that temperature has a very strong influence on the early-season activity of the disease. Early-planted cotton had a longer period of development before being attacked by root rot, but the disease developed more rapidly in the early than in the late plantings.

Report of the fifth annual cotton-root-rot conference, W. N. EZEKIEL ET AL. (*Phytopathology*, 22 (1932), No. 12, pp. 983-993; abs. in *Texas Sta. Circ.* 68 (1932), p. 28).—Brief abstracts are given of 55 technical papers presented at the annual root rot conference held at Austin, Tex., on February 1 and 2, 1932, including the results obtained in 1931 in studies relating to physiologic specialization of *Phymatotrichum omnivorum*, growth and nutrition of the fungus, sclerotial and spore stages, host plants, infection and resistance, hibernation and transmission of root rot, occurrence of root rot and estimation of losses; and studies bearing on the control of the disease from the aspects of

soil conditions, including reaction, fertilizers, disinfectants, barriers to limit spread of root rot, subsoiling and crop rotation, and resistant species and varieties.

The isolation of catechol from pigmented onion scales and its significance in relation to disease resistance in onions, K. P. LINK and J. C. WALKER (*Jour. Biol. Chem.*, 100 (1933), No. 2, pp. 379-383).—In work here reported from the Wisconsin Experiment Station, catechol (3,4-dihydroxybenzene) has been isolated from the outer scales of pigmented onions. It is not present in the scales of the white onion. Catechol, along with protocatechuic acid (3,4-dihydroxybenzoic acid), appears to be the chief toxic substance that enables the pigmented onion to resist the invasion of the fungus *Colletotrichum circinans*, the organism responsible for the disease known as "smudge."—(Courtesy Biol. Abs.)

Pea wilt and root rots, J. C. WALKER and W. C. SNYDER (*Wisconsin Sta. Bul.* 424 (1933), pp. 16, figs. 5).—Consisting for the most part of general information on the nature and control of several diseases, certain experimental results are incorporated in this bulletin. There was found an apparent correlation between soil type and the outbreaks of wilt (*Fusarium orthoceras pisi*). At Ashland wilt-susceptible peas grown on introduced soil were attacked, while neighboring vines in Superior red clay were not injured. Similar results were secured when Superior red clay was taken to Madison. However, control is said to rest largely in the use of resistant varieties.

In a study of root rot resulting from *Aphanomyces*, marked reductions in injury were obtained by simply adding fertilizer to the soil.

The bacterial wilt disease of peanuts (*Arachis hypogaea* L.), A. P. D. McCLEAN (*Union So. Africa Dept. Agr., Sci. Bul.* 87 (1930), pp. 14, pls. 7).—Peanut bacterial wilt or slime disease (*Bacterium solanacearum*) is said to have been first recorded during 1905 from Java. Supposedly the same disease is now recorded in South Africa for the first time. Apparently it is confined to the coastal belt of Natal. Pure culture inoculation studies using both peanuts and tomatoes show it to be equally pathogenic to both, but only to the Joiner variety of tobacco.

Potato blight (*Seale-Hayne Agr. Col. Pam.* 36 (1931), pp. 21-23).—This account gives brief data as regards the relation of potato blight to time of planting and to weather.

Older plants are more blight susceptible than young. An apparent exception is explained on the supposition that plants on shallow soil, maturing earlier, are physiologically older than plants on deep soil. Days during which relative humidity exceeds 80 percent, described as muggy and close and unpleasantly enervating, are ideal for blight.

General biology of potato canker, K. SCHILBERSZKY (*Die Gesamtbiologie des Kartoffel-Krebses. Freising-München: F. P. Datterer & Co., 1930, pp. 72, pl. 1, figs. 9*).—This exposition deals with the potato wart or canker disease as regards the general biology of the causal and related organisms.

Varieties of potatoes with their synonyms, immune from and susceptible to wart disease (*Cambridge, Eng.: W. Heffer & Sons, 1933, rev. ed., pp. [3]+35*).—Some results of the activities of the Potato Synonym Committee of the National Institute of Agricultural Botany (E.S.R., 69, p. 201).

The fungoid diseases associated with the eelworm attack on potatoes, W. A. MILLARD (*Agr. Prog. [Agr. Ed. Assoc., London], 7 (1930), pp. 58-60*).—In connection with nematode attack on the potato there can be found usually both, apparently always one, of the diseases stem canker or collar rot (*Corticium solani*) and black dot (*Colletotrichum atramentarium*).

"The suggestion is made, therefore, as a deduction from our own observations as well as for the purpose of providing a clear-cut basis for subsequent discussion, that potato sickness is really caused by the two fungoid diseases described, acting alone or in combination, and that the eelworms found on the sick plants are negligible 'camp followers', or at most weakly parasites of little significance. Whilst we must at this stage confine our discussion mainly to those known groups of organisms, however, the possibility of some further factor of the disease cannot be precluded."

The potato eelworm, T. H. TAYLOR (*Agr. Prog. [Agr. Ed. Assoc., London]*, 7 (1930), pp. 57, 58).—A brief account is given of the increasing importance of *Heterodera schachtii* in detrimental connection with potato production in England since the identification in 1916 of that organism as a pest of potato and its recognition in 1923 as of economic importance. The discovery has been made of well-known potato fungi entering the plant in connection with nematode attacks.

The eggs and young in the cysts apparently can remain alive in the ground for several years, and it seems impractical to starve out the pest by rotation. Although supposedly no dressings tried destroyed the nematodes, yield was improved by the use of farmyard manure and other organic fertilizers.

Though the potato is probably more effective as a trap crop than any other plant, its use necessitates at present loss of a season's crop in removing or lessening the nematodes.

Preliminary study of the blast disease of rice in Bulgaria [trans. title], D. N. DODOV (DODOFF) and I. KOVACHEVSKI (J. KOVACHEVSKY) (*B''lgarsk. Zeml. Druzh. Nauch. Trud. (Bulgar. Agr. Soc. Sci. Pub.) No. 25 (1930), pp. 61, pls. 5, figs. 3; Eng. abs., pp. 54-56*).—Rice, a very profitable crop in Bulgaria, is also a very unreliable one on account of the fact that the disease called locally "chalgun" occurs almost every year in the rice-growing regions of the country. This rice disease is said to agree fully with that called "blast" in America and imotsi or imochibyo in Japan, and partly with that called brusone in Italy. It is claimed that investigations during three years indicate that blast in Bulgaria is not physiological, but that it is due to parasitism by *Piricularia oryzae* and by *Sclerotium oryzae*, the former having the greater distribution. Descriptions and discussions of both are given as resulting from the study indicated.

The chief control measures recommended are the use of uniformly well aerated rice land and resistant varieties, and also in the case of *S. oryzae* the destruction of the stubble by fire, rotation including dry-land crops, and isolation of infected areas.

Brief accounts are also given of *Sclerospora macrospora* and straight head, which are said to be of less economic importance.

[Diseases of sugarcane] (*Internatl. Soc. Sugar Cane Technol. Cong. [San Juan] Proc., 4 (1932), pp. [186], figs. 98*).—Papers on plant diseases presented at the Fourth Congress of the International Society of Sugar Cane Technologists held in San Juan, P.R., March 1-16, 1932, included Sugarcane-Seedling Mosaic Elimination by R. L. Davis (Bul. 19, pp. 17), Life History of *Ligniera (Plasmodiophora) vascularum* (Bul. 31, pp. 3), *Melanconium sacchari*—Parasite or Saprophyte? (Bul. 33, pp. 2), and Report on the International Survey of the Diseases of Sugar Cane (Bul. 128, pp. 15), all by M. T. Cook; Control of *Striga* spp. on Sugar Cane in the Central Provinces, by J. F. Dastur (Bul. 25, p. 1); Studies of the Sugar-Cane Root Parasite, *Aeginetia indica*, by A. Lee and F. Goseco (Bul. 101, pp. 12); Abnormal Growths of Sugar Cane, by J. P. Martin (Bul. 73, pp. 24); Pokkah Boeng, by D. S. North (Bul. 100,

pp. 2) ; The Red-Rot Disease, by E. C. Tims and C. W. Edgerton (Bul. 26, pp. 5) ; Report of Committee on Protective Sugar-Cane Quarantine, by E. W. Brandes (Bul. 126, pp. 9) ; Artificial Transmission and Other Studies on Sugar-Cane Mosaic (Bul. 84, pp. 6) and Soil Animals and Root Disease in Porto Rico (Bul. 91, pp. 2), both by F. Seín, Jr.; and the Nematodes Attacking Sugar-Cane Roots in Hawaii, by R. H. Van Zwaluwenburg (Bul. 5, pp. 4).

A symposium on virus diseases included Sugar-Cane Mosaic, by J. F. Dastur (Bul. 24, pp. 4) ; Mosaic Disease of Sugar Cane and Its Control in South Africa, by A. P. D. McClean (Bul. 37, pp. 3) ; Studies on Apparent Recovery of Certain Sugarcane Varieties from Mosaic in Louisiana, by R. D. Rands and E. M. Summers (Bul. 123, pp. 7) ; Experiment to Test the Difference in Yield between Sugar Cane with Mosaic Disease and Free from Mosaic Disease during the Season 1930-31 in Pusa, by W. McRae (Bul. 28, pp. 4) ; The Measure of Intensity and Variations of the Discoloration of Sugar-Cane Leaves (Bul. 38, pp. 4) and Variations in Thickness of Mottled and Healthy Sugar-Cane Leaves (Bul. 39, pp. 11), both by R. Ciferri; Field Control of Mosaic Disease in Hawaii, by J. P. Martin (Bul. 60, p. 1) ; and The Behaviour of the Cane Variety P.O.J. 213 towards Streak Disease, by A. P. D. McClean (Bul. 27, pp. 6).

A group of papers on rot and bacterial diseases comprised Seed-Borne Diseases of Sugar Cane, by J. P. Martin (Bul. 59, p. 1) ; Disease-Resistance Trials, by A. F. Bell (Bul. 29, pp. 2) ; The Parasitism of *Marasmius sacchari* Wakker (Bul. 32, pp. 4), The Transmission of Sugar-Cane Diseases by Cane Cuttings (Bul. 34, pp. 2), The Gummosis of Sugar Cane (Bul. 35, pp. 2), and Rotting of Seed Cuttings in Porto Rico (Bul. 36, pp. 2), all by M. T. Cook; Seed Rots of Sugar Cane in Louisiana, by E. V. Abbott (Bul. 48, pp. 2) ; an Improved Method for the Isolation of the Leaf-Scald Organism, by A. F. Bell and W. Cottrell-Dormer (Bul. 72, pp. 5) ; Diseases Resembling Leaf Scald, by G. Wilbrink (Bul. 117, pp. 8) ; The Estimation of Losses Due to Red Stripe Disease in Queensland, by W. Cottrell-Dormer (Bul. 43, pp. 6) ; An Epidemic Outbreak of Red Stripe Disease of Sugar Cane and the Reaction of Some Seedling Progenies, by R. D. Rands and E. Dopp, Jr. (Bul. 46, pp. 5) ; Obtaining Resistant Cane Varieties for the Control of Gumming Disease, by D. S. North (Bul. 30, pp. 3) ; and Growth Failure of Sugar Cane in Hawaii, by C. W. Carpenter (Bul. 42, pp. 2).

A root rot of sweet clover and related crops caused by *Plenodomus meliloti* Dearnness and Sanford, G. B. SANFORD (Canad. Jour. Res., 8 (1933), No. 4, pp. 337-348, pls. 2, figs. 2).—The occurrence, hosts, and symptoms of a hitherto undescribed disease of *Melilotus*, *Medicago*, and *Trifolium*, called brown root rot, and the relation of temperature and the reaction of substrate to growth of the pathogen *P. meliloti* are discussed, and its pathogenicity demonstrated.

The disease is characterized by brown lesions, on or within which are an abundance of black to dark brown pycnidia. These bodies, 0.5 to 2 mm in longest diameter, may have one or more spore-bearing chambers. Each chamber may have one to several ostioles, through which the one-celled spores, averaging 5.2 by 2.84 μ exude. The hyphae do not bear spores. The hosts mentioned seemed to be susceptible only during the winter and early spring dormancy stage. Normal roots of sweetclover, when frozen at -4° C. for four days and subsequently kept at 2° to 3° , 9° , and 16° , did not become susceptible. The brown root rot disease is distinct from true winter injury resulting from insufficient hardiness to cold. The temperature range for vegetative growth and pycnidia of *P. meliloti* is from 0° to 27° , with optimum between

15° and 17°. Increasingly good growth occurs from 2° to optimum temperature. Severe lesions are produced at 2° to 3°, 9°, and 16°. The optimum pH value for growth in potato dextrose decoction is about 6.2, the other limits being approximately pH 3.2 and 8.2. Soils with an alkaline reaction apparently were unfavorable.

Dissemination of the pathogen by seed would not seem to be of practical importance. Control by crop sanitation is recommended, at least until varieties more resistant are available.

A new bacterial disease of tobacco leaves in Rumania [trans. title], T. SĂVULESCU and I. RĂDULESCU (*An. Inst. Cercet. Agron. României* (*Ann. Inst. Rech. Agron. Roumanie*), 1 (1930), pp. 70-170, pl. 1, figs. 31; *Fr. trans.*, pp. 129-167).—An account is detailed of a very threatening tobacco leaf disease in Rumania which is said to be identical with the so-called "Wisconsin" bacterial leaf spot ascribed to *Bacterium melleum*. The forms most readily attacked are the original Iaka and the acclimated Iaka that is called Suluk; the varieties Ghimpați and Herzegovine being less severely attacked. Humidity and temperature are important factors. Primary infection occurs on the beds, and secondary infection follows in the fields. The organism invades both cells and intercellular spaces. Under natural conditions injury is not necessary to infection. Chemical soil treatment has proved successful. The production of young plants free from infection is regarded as a safe check to the extension of the disease.

Testing Iowa wilt-resistant watermelons in Texas, J. J. TAUBENHAUS and W. N. EZEKIEL (*U.S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 16 (1932), No. 3 pp. 21, 22; *abs. in Texas Sta. Circ.* 68 (1932), p. 27).—Planted in *Fusarium* wilt-infested soil, Pride of Muscatine, Iowa Belle, and Iowa King watermelons developed only 4 percent of diseased plants as compared with 48.2 percent for the Tom Watson variety used as a check.

Perennial apple tree canker, H. T. GÜSSOW (*Canada Dept. Agr. Pam.* 116, n. ser. (1930), pp. 7, figs. 2).—The so-called "perennial" apple tree canker, due really to reinfections occurring annually, is said to be found principally in orchards where woolly aphid is prevalent and in varieties subject to winter-killing. Pruning wounds offer favorable points of entrance.

Varieties affected severely include Spitzenberg, Grimes Golden, Jonathan, Yellow Newtown, Cox Orange, and Wagner. Those less severely affected include Wealthy, Rome Beauty, Winesap, Delicious, McIntosh, Stayman Winesap, and Winter Banana, which shows only casual infection.

Perennial canker of apple trees, H. R. McLARTY (*Canad. Jour. Res.*, 8 (1933), No. 5, pp. 492-507, pls. 2, fig. 1).—In 1925 a new disease of apple trees was described by Zeller and Childs (*E.S.R.*, 54, p. 349; 58, p. 151) and named perennial canker (*Gloeosporium perennans*). This paper presents the results of a study of the various factors responsible for the production and spread of the disease and an interpretation of the part that each plays in its production. It is shown that its occurrence is entirely dependent on the annual inoculation of the host with the causal organism during the late summer and autumn, the presence of the woolly apple aphid which carries out this inoculation, and the exposure of the host after inoculation to periods of low temperature. Other factors, such as winter injury, time of pruning, and precipitation, are contributory to its severity, but not essential for its general occurrence.—(*Courtesy Biol. Abs.*)

Die-back of fruit trees in the Western Cape Province, O. S. H. REINECKE (*Union So. Africa Dept. Agr. Bul.* 97 (1931), pp. 16, figs. 5).—Fruit tree die-back is herein descriptively discussed as noted in the Western Cape Province, with

particular reference to its injurious relations to peach trees in that area and as found to correlate with climatic and weather factors.

Recommendations include the use, in bad years when apple and pear trees are due to bloom, of some light oil spray to help break the rest period. Shelter on the north side is thought desirable. "Experiments . . . are under way to devise, if possible, some practical means of protecting from the sun members of the stone fruit family."

Investigations on black knot of plums and cherries.—I, Development and discharge of spores and experiments in control, L. W. KOCH (*Sci. Agr.*, 13 (1933), No. 9, pp. 576–590, figs. 5).—Work conducted at the Dominion Laboratory of Plant Pathology, Saint Catharines, Ont., showed that a combination of pruning and spraying gave more than 95 percent control of black knot. Rainfall appeared to be the dominating factor determining the occurrence but not the abundance of ascospore discharge. Temperatures below 40° F. apparently reduced ascospore discharge. The ascospores were found to be wind borne to distances of 30 ft. from the affected tree, and moisture and wind appeared to be the most important factors in the dissemination of conidia. Apparently neither ascospores nor conidia of the black knot fungus matured at the same time in different localities on the same or different host plants.

Diseases of plums and their control, G. H. BERKELEY (*Canada Dept. Agr. Pam.* 119, n. ser. (1930), pp. 12, figs. 4).—This account of plum disease and injury control deals with black knot (*Dibotryon morbosum*), brown rot (*Sclerotinia americana*), plum pockets (*Taphrina pruni*), shot hole or leaf spot (*Coccomyces prunophorae*), silver-leaf (*Stereum purpureum*), and winter injury.

[Fruit storage] (In *Proceedings of the First Imperial Horticultural Conference, London, 1930. East Malling, Eng.: Imp. Bur. Fruit Prod., 1931, pt. 3, pp. 25–60, 78–90, 98–101, pls. 7, figs. 6*).—Among the papers presented at this conference bearing upon progress in the maintenance of fruit values, especially during transportation, a few dealt more particularly with forms, factors, and processes of deterioration and its prevention.

Recent progress in the study of Jonathan breakdown in Canada, R. C. Palmer (pp. 25–37).—"From the data presented in this paper it is apparent that a good deal has been learned regarding the influence of cultural, harvesting, and storage conditions on the development of Jonathan breakdown. Furthermore, there is evidence that real progress has been made in devising practical control measures designed to prevent repetition of the disastrous losses which have occurred in the past. On the other hand, the information which has been secured only serves to emphasize the urgent need for more fundamental research to determine the primary cause of the disease."

The present position of the bitter pit problem in Australia, W. M. Carne, H. A. Pittman, and H. G. Elliott (pp. 37–49).—It is stated that, as the outcome largely of conclusions put forth by Smith (*E.S.R.*, 57, p. 650), the present investigations were commenced in the apple season of 1927–28. These are still in progress, having been extended beyond bitter pit to various apple diseases of causation other than parasitic, particularly some affecting apples shipped overseas. "The present paper covers only the results obtained and conclusions arrived at in relation to bitter pit in the sense used by McAlpine and Smith, and still largely by Australian horticulturists. . . . Both bitter pit and cork have so much in common with the disease known as water core or glassiness, that the three may be grouped under a common heading as water deficiency diseases of pome fruits." The paper therefore deals with these defects "as having fundamentally a common origin, the differences being due to the operation of the varying factors of variety, maturity, and environment." This work is detailed.

Experiments on the preservation of citrus fruits, W. J. Young and F. M. Read (pp. 50, 51).—These experiments, carried out for the Council of Scientific and Industrial Research of Australia with a view to lengthening the storage life of oranges, included investigations on the effect of careful handling of the fruit from picking to the final storage; the effect of washing oranges with various solutions before packing, as borax, sodium bicarbonate, sodium sulfite, and salicylic acid; the effect of coating the fruit with a thin film of paraffin wax after washing; and the optimum temperature of storage.

Penicillium italicum and *P. digitatum* have been found to cause loss in storage. Browning and pitting of the skin does not damage the pulp, at least during the early stages, but it spoils the appearance and reduces the value. Navel oranges have been observed to acquire a pale yellow color, with a dull and mottled appearance, this condition apparently preceding a general collapse and attack by *Penicillium* molds. This trouble was the chief cause of wastage in one experiment, in which the fruit was stored at 38° F., appearing after several weeks' storage, but it did not occur in the same fruit stored at 45°.

A form of stem rot was observed only in Valencia oranges. This is described as showing, after about 16 weeks, definite infection with *Alternaria citri*.

Bananas: The behavior and diseases of the banana in storage and transport, C. W. Wardlaw and L. P. McGuire (pp. 52–60).—In a study carried out in storage and during ripening of banana varieties immune to stalk rot while seeking a substitute for the susceptible but valuable variety Gros Michel, promise was apparent in Lacatan and Cavendish only, as judged by commercial criteria.

The main-stalk rot is said to be due to a plurality of organisms, the more important of which have been isolated in pure culture, identified, and evaluated as to growth rates at different temperatures and pathogenicity. Measures against stalk rot as detailed involved careful selection of fruit at the correct stage of maturity (determined chiefly by the length of the voyage), shortening as much as possible the interval between gathering and placing in cold storage, thorough precooling of the whole bunch before cutting into hands and the vaseline treatment for journeys of 10 days or longer, rapid transference from the precooling station to the ship's hold (using insulated conveyors if necessary), maintenance of a temperature of from 53° to 55° in the case of the varieties Cavendish and Gros Michel, the complete change of the storage atmosphere at least once (preferably twice in the case of large consignments) per day, and the use of dunnage on crates and the provision of vertical breaks in the cargo stack when these are large. In the course of bulk-storage trials, Cavendish gave promising results, which are to be further tested.

As regards the transport of bananas in paper wrappers, perforated bags allow more rapid cooling and more efficient ventilation. Measures have been submitted for the reduction of wastage in crated cargoes of bananas. The importance of precooling the bunch before cutting into hands, it is said, cannot be too strongly emphasized.

The biological effects of humidity in the storage of fruit, R. G. Tomkins (pp. 78–82).—It seems that by controlling the external humidity at a value of 80 to 85 percent or less some reduction of rotting may be attained. It does not appear that this reduction is likely to be as extensive as has been generally supposed. Further, in considering the advisability of the use of low humidities, the advantage of the reduction in the amount of wastage has to be weighed up against possible damage due to excessive water losses and troubles from physiological disorders. Also the custom of packing most fruit in boxes may make the attainment of constant humidity conditions difficult practically.

"It would seem, therefore, that the control of humidity is not likely to be the factor which in combination with temperature control is likely to bring about marked prolongation of storage life. Humidity is, however, not by any means the only other external factor which may be controlled, and successful prolongation of the storage life of fruit may be sought along many other lines."

The infection and invasion of the apple fruit by fungi in relation to the problem of storage, A. S. Horne (pp. 83-90).—Conditions, consequences, and prevention of fungus invasions of apples in storage are set forth in compact detail, with some generalizations.

The distributions of the organisms in air are rather at random. Fungus species and strains vary with locality, and, in a general way, wastage varies accordingly. Resistance cannot be measured by direct methods. Apple populations of the same variety from different sections differ as to resistance. The question of differences in chemical composition is receiving attention. Invasion rate varies on account of temperature and acid, but resistance changes do not appear to parallel nitrogen content. Strains of *Phomopsis*, *Diaporthe*, and *Cytosporina* vary greatly in their power of attacking apples. In the cases indicated attack intensity is clearly related to growth rate obtained in the nutrient media employed.

Biochemical investigations on the storage diseases of apples, with special reference to aldehyde poisoning, M. Thomas (pp. 98-101).—Conclusions are detailed as resulting from work indicated.

So long as they remain healthy, apples even when ripe contain not more, and usually much less (fresh weight), than 0.01 percent of ethyl alcohol when stored in air. Following injury in air, zymasis may occur in the injured portions, which may also show as high as 0.1 percent ethyl alcohol, or below 0.01 percent acetaldehyde. In the absence of oxygen, zymase may occur to some extent increasingly in all grown apples. Concentrations of ethyl alcohol as high as 0.6 percent have been found, but concentrations of acetaldehyde as great as 0.01 percent never developed. If removed early from anaerobic conditions no injury develops, but prolonged exposure eventuates in tissue poisoning, also described as alcohol poisoning. In the presence of oxygen, carbon dioxide of certain concentrations (above, also supposedly below, 20 percent) is peculiarly toxic to apples. This is discussed.

The results are presented, with discussion, of analyses carried out with apples from two ships arriving in 1930 from Australia and bearing severely injured storage apples.

A fruit rot in strawberries (*Seale-Hayne Agr. Col. Pam. 36 (1931), p. 26*).—Early in June 1930 strawberry specimens received from the Tamar Valley showing fruit rot, which had been observed increasingly in the valley for four years, were found affected by a fungus identified as *Phytophthora cactorum*, this being supposedly its first appearance in England. This is the same as the disease that has been called leather rot in the United States. It is quite different from the soft, wet decay caused by *Botrytis cinerea*. The disease is thought to start from the organism in soil splashed onto fruits by rain.

Esca on grape stocks of two years [trans. title], A. BALLEAU (*An. Inst. Cercet. Agron. României (Ann. Inst. Rech. Agron. Roumanie), 1 (1930), pp. 278-281, fig. 1; Fr. trans., pp. 280, 281*).—In 1930 the author noted in a few vines at the experiment station for viticulture at Chişinău, in a planting of Aligoté grafted on *Vitis riparia* × *V. rupestris* in 1929, abnormal characters which are described as corresponding to the disorder associated with attack by *Stereum necator*.

On the occurrence of a berry wilt and rot of grapes (*Vitis vinifera*) caused by *Sphaeropsis malorum*, Berk., L. VERWOERD and B. J. DIPPENAAR (*Union So. Africa Dept. Agr., Sci. Bul.* 86 (1930), pp. 16, figs. 8).—This preliminary report states that the grape disease in the Breede River area of the Worcester district, Western Cape Province, appearing in 1927 and since extending, has been observed for some years in the districts of Stellenbosch and Paarl, though it has not until recently seriously injured crops. Observations in the field have indicated that under favorable conditions the disease may seriously diminish crop returns, as in the season of 1928–29, when a loss of from 25 to 30 percent is estimated to have occurred in one vineyard.

Apparently the fruit only is affected. The limited amount of diseased material available yielded an organism which agreed morphologically with *S. malorum*.

Water spot and water rot of citrus fruits, H. S. FAWCETT, L. J. KLOTZ, and A. R. C. HAAS (*Calif. Citrogr.*, 18 (1933), No. 6, pp. 165, 175, figs. 4).—Rind breakdown and decay of oranges on the trees following protracted periods of winter rain were reproduced in the laboratory of the Citrus Experiment Station, Riverside, by soaking fruits in water for from 15 to 24 hours or in the orchard by soaking undetached oranges in vessels of water hung in the tree. It was evident that when oranges attain sufficient maturity water may be imbibed through imperfections or breaks in the cuticle. The water rot which follows is due to micro-organisms which develop during the continued or subsequent wet weather. Obviously any orchard treatment that prevents mechanical injury to the fruit must lessen the amount of trouble.

Mal secco of lemon [trans. title], G. SAVASTANO and H. S. FAWCETT (*Ann. R. Staz. Sper. Agrumic. e Fruttic. Acireale*, 11 (1931), pp. 1–37, pls. 6, fig. 1; *Eng. abs.*, pp. 27–29).—*Deuterophoma tracheiphila* is pathogenic on nursery trees, causing mal secco, which does not result from infection by any such associated or succeeding organisms as *Colletotrichum gloeosporioides*, *Phomopsis citriputeale* or other *Phomopsis* sp., and *Fusarium* sp. A mixed inoculation using *Fusarium* sp. and *Deuterophoma* underwent certain inhibitions as regards infection which is not yet understood. Following artificial as well as natural infection, *Deuterophoma* was isolated from the fruits, as also from test points at short intervals throughout the woody elements, both aboveground and underground, in mature trees. Inoculations on mature trees showed that the severity of the disease decreased toward the top. Root inoculations showed much more severe effects than did twig or small branch infections. The disease travels much faster upward than downward from the point of inoculation. While the leaf is alive or newly removed by abscission from the petiole affected by mal secco, no *Deuterophoma* is apparent except in the fibrovascular bundles of the midrib. The reddish-orange discoloration in newly cut wood indicates reliably the presence of the fungus. The dark-colored area in the wood, presumably a late stage, may or may not contain the living fungus. After artificial as well as natural infection, the resulting discoloration could be followed, widening from root to top of the tree; also the reddish-orange color deepened upwards, while the dark color was more pronounced in the root and lower trunk.

Isolation tests, both from natural and from artificial infection, showed the presence of the fungus from root to top. The possibility of root infection is indicated, though in some trees it could not be definitely traced. "Without excluding the possibility of top infection, under natural conditions it seems that the most severe and rapid form of mal secco comes from root infection."

The Armillaria root disease of tea, C. H. GADD (*Tea Quart. [Tea Res. Inst. Ceylon]*, 3 (1930), No. 4, pp. 109–113, pls. 2).—"There can be little doubt that

the *Armillaria* root diseases of Ceylon, Java, and West Africa are the same, and that the fungus which causes them is closely allied to *A. mellea*, a well-known saprophyte and parasite of forest and orchard trees in temperate zones. . . . At present, the name *A. mellea* is in common usage for the tropical fungus. . . . *A. mellea* almost always begins life as a saprophyte upon decaying tree stumps or jungle roots. From such centers the fungus spreads to adjacent susceptible plants. . . . As with other root diseases of tea, there is no above-ground symptom noticeable until the bush is moribund. Then the leaves rapidly wither, turn brown, and fall. . . . In addition to *Acacia decurrens*, *Albizia lophantha*, and tea, the disease has been found in Ceylon on young grevilleas growing in close proximity to infected jungle stumps and diseased tea." Treatment is outlined.

Sclerotinia wilt of greenhouse snapdragons, J. J. TAUBENHAUS and W. N. EZEKIEL (*Amer. Jour. Bot.*, 19 (1932), No. 10, pp. 808-811, fig. 1; *abs. in Texas Sta. Circ.* 68 (1932), pp. 27, 28).—A serious wilt disease found on fall greenhouse snapdragons grown in the vicinity of Temple, Tex., was artificially reproduced by inoculation with *Sclerotinia* isolated from snapdragons and other hosts and the fungus reisolated. The sclerotia produced apothecia, asci, and ascospores typical of *S. sclerotiorum*.

The control of tulip fire (Seale-Hayne *Agr. Col. Pam.* 36 (1931), pp. 27, 28).—Of five methods listed as possibly offering control of tulip fire, the only one yet found certain is that of lifting and transplanting each year to fresh soil. "The length of time which must elapse before it is safe to replant tulips in soil where they have been grown before has not been established, but observations show that it is certainly not less than three years."

On a new damping-off disease of Texas bluebonnets, J. J. TAUBENHAUS and W. N. EZEKIEL (*Mycologia*, 24 (1932), No. 5, pp. 457-459, fig. 1; *abs. in Texas Sta. Circ.* 68 (1932), p. 27).—*Pythium debaryanum* and a *Rhizoctonia* sp. found on Texas bluebonnet plants transplanted into the greenhouse were readily controlled by steam sterilization of the infested soil and the disinfection of young seedlings at the time of transplanting with mercury bichloride solution.

A bacterial gall disease of the Douglas fir, H. N. HANSEN and R. E. SMITH (*Science*, 77 (1933), No. 2009, p. 628).—This is a report, from the University of California, of globular galls of twigs and stems of *Pseudotsuga taxifolia*, experimentally shown to be due to a nonmotile rod giving a white colony with metallic sheen, smooth surface, and undulate margin.

An account of a crown rot of English walnut trees in Victoria, I. C. COOKSON (*Roy. Soc. Victoria, Proc., n. ser.*, 42 (1929), No. 1, pp. 5-25, pl. 1, figs. 26).—In the spring of 1922 a crown canker or root rot of *Juglans hindsii* became evident in northern California. Earlier, Smith and Smith (*E.S.R.*, 58, p. 52) had studied what is supposed to be the same organism. The present author agrees in placing it in the genus *Phytophthora*. The taxonomy of the fungus is discussed, and a certain affinity with *P. parasitica* is found to be supported. It is pathogenic to seedlings of *J. regia*, which have in turn given back the organism in pure culture.

Walnut yellows in relation to ash composition, manganese, iron, and other ash constituents, A. R. C. HAAS (*Bot. Gaz.*, 94 (1933), No. 3, pp. 495-511, figs. 2).—At the Citrus Experiment Station, Riverside, Calif., bark and leaves collected from healthy and diseased Persian walnut (*Juglans regia*) were, following drying at 80° C. and pulverizing, analyzed for calcium, magnesium, inorganic phosphate, manganese, and iron. A higher percentage of ash was found in the diseased than in the healthy bark, and calcium, mag-

nesium, manganese, and inorganic phosphate were also generally higher. In the case of leaves, those affected with yellows contained more magnesium, inorganic phosphate, manganese, and iron than did healthy leaves. Hence a deficiency of manganese cannot be associated with the disease unless unavailability is a factor.

A note on two Marssonina diseases on willows, R. M. NATTRASS (*Egypt Min. Agr., Tech. and Sci. Serv. Bul.* 99 (1930), pp. [2]+19, pls. 18).—An account is given of a *Marssonina* disease of tree willows in Egypt and of a *Marssonina* disease of the basket willow in England, with comparisons and an account of inoculation experiments. The Egyptian fungus is referred to *M. kriegiana* and the English to *M. salicicola*, though it is regarded as questionable whether the two are in fact distinct.

The diagnosis of decay in timber, K. ST. G. CARTWRIGHT and W. P. K. FINDLAY (*Empire Forestry Jour.* [London], 9 (1930), No. 2, pp. 190–203, pls. 2).—"It is usually quite a simple matter to determine whether a piece of wood is decayed or not, but sometimes the first stages of decay may be overlooked. Various methods have therefore been adopted to investigate the soundness of a piece of timber which shows no obvious signs of decay. The first part of this paper deals with the problem of discovering whether or not [a] fungus has been responsible for the deterioration of the wood, and the second describes methods whereby the identity of the specific fungus causing the decay may be determined."

The root-infesting eelworms of the genus Heterodera: A bibliography and host list (St. Albans, Eng.: Imp. Bur. Agr. Parasitol., 1931, pp. VIII+99, pls. 2).—A brief introduction (pp. V–VIII) is followed by a general discussion of the eelworms of the genus *Heterodera* (pp. 1–12), host lists of three species of *Heterodera* (*H. radiculicola*, *H. punctata*, and *H. schachtii*) arranged alphabetically under natural orders (pp. 13–38), a list of the scientific and common names of hosts arranged alphabetically (pp. 39–49), the synonymy of *Heterodera* (p. 50), a bibliography arranged chronologically (pp. 51–89), and an index of authors (pp. 90–99).

Development of the root-knot nematode as affected by temperature, J. TYLER (*Hilgardia* [California Sta.], 7 (1933), No. 10, pp. 389–415, figs. 3).—Using Earliana tomato plants as the exclusive host, the minimum time required for the life cycle of the root knot nematode was 25 days at 27° C., increasing to 87 days at 16.5°.

The rate of development was accelerated with rising temperatures through the medial range, with marked retardation of the average rate above 28°. Below 16.5° development was relatively more rapid than the average shown by the velocity curve. Individual nematodes varied considerably in their rate of development.

Root penetration by larvae in the soil occurred at temperatures as low as 12°, and cultural experiments indicated the beginning of development at about 9°. No eggs were laid below 14.3° or above 31.5°, but it was not determined whether nutrition or temperature was the limiting factor. Free larvae were found capable of root penetration after 5 days' exposure in plates at 35°. Eggs developed from the 1- or 2-celled stage to hatching in 9 days at 27° and in 31 days at 16.5°. Root penetration and gall formation required 4 days or more at 15° and 21 hours at 35°.

Reproduction without males in aseptic root cultures of the root-knot nematode, J. TYLER (*Hilgardia* [California Sta.], 7 (1933), No. 10, pp. 373–388).—In studies which employed a newly described method of obtaining uncontaminated larvae and raising them on sterile seedlings, reproduction without

males was observed to be apparently regular and normal for root knot nematodes. In fact one family was carried through 12 complete generations by repeated isolations. Males appeared more frequently in old, unhealthy, or heavily parasitized roots, and apparently in the field males occurred also under adverse conditions.

Larvae grown in root cultures were much more active in entering growing seedlings in vitro than were larvae obtained from the field. There was observed also a great variation in this respect among different lots of nematodes grown in soil, a result due partly but not wholly to the freshness of the larvae.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Proceedings of the Eleventh International Congress of Zoology, 1930 (*XI. Congresso Internazionale di Zoologia, Padova, 1930. Atti. Padova, 1932, vols. 1-3, pp. XXIII+150+1508, pls. 38, figs. 190; also Arch. Zool. Ital., 16 (1931), No. 1-2, pp. 1-837, pls. 26, figs. 120; 16 (1932), No. 3-4, pp. 839-1508, pls. 12, figs. 70*).—The proceedings (E.S.R., 62, p. 240) of the Congress held at Padova (Padua), Italy, September 4-11, 1930, are here presented, the papers being given under 15 sectional headings. Included are the following: General zoology (pp. 189-397), ecology (pp. 507-582), zoogeography (pp. 583-689), comparative anatomy (pp. 693-837), comparative physiology (pp. 839-964), protistology (pp. 965-994), entomology (pp. 995-1101), silk culture (pp. 1263-1295), symbiosis and parasitism (pp. 1297-1448), zoological nomenclature (pp. 1449-1508), etc. Among the papers contributed is one from the Kansas Experiment Station by J. E. Ackert on Fowl Resistance to Parasitism Affected by Vitamins A and B (pp. 1369-1379), based upon work previously noted (E.S.R., 64, p. 680).

The balance of animal populations, A. J. NICHOLSON (*Jour. Anim. Ecol., 2 (1933), No. 1, pp. 132-178, figs. 11*).—Part 1 of this contribution from Australia takes up the natural limitation of populations (pp. 132-146) and part 2 the effect of competition on the densities of animal populations (pp. 146-176).

Annual report of the State game and fish commissioner, J. H. ROSS (*Missouri State Game and Fish Commr. Ann. Rpt. 1932, pp. 220, figs. 94*).—Referred to in this report is an account of the Fishes of Missouri, described by G. M. Kirby (pp. 76-93); Further Introduction of Ring-Neck Pheasants, a survey made by W. B. Grange (pp. 143-149); Pheasant Research, 1932, by H. Blakey (pp. 150, 151); Upland Game Bird Survey of the State of Missouri, prepared by H. L. Blakey (pp. 155-176); Fur Resources (pp. 177-206), including a description of the Mammalia of the State (pp. 182-206); etc.

Game management, A. LEOPOLD (*New York and London: Charles Scribner's Sons, 1933, pp. XXI+481, pls. 2, figs. 35*).—Part 1 of this work deals with management theory (pp. 1-136), part 2 with management technic (pp. 137-388), and part 3 with game administration (pp. 389-423). A bibliography, glossary of terms used in game management, breeding potential tables, and an index are included. The drawings illustrating the work are by A. Brooks.

The crop of cedar nuts, invasions into Europe of the Siberian nutcracker (*Nucifraga caryocatactes macrorhynchus Brehm*), and fluctuations in numbers of the squirrel (*Sciurus vulgaris L.*), A. N. FORMOSOF (*Jour. Anim. Ecol., 2 (1933), No. 1, pp. 70-81, figs. 3*).—This is a contribution from the laboratory of zoology of Moskva (Moscow) University.

The cranberry grower's interest in birds, J. B. MAY (*Mass. Dept. Agr., Dept. Pub. 133 (1931), pp. 10, figs. 14*).—This is a summary of practical information on birds that attack insect enemies of the cranberry, and means for attracting them.

The life histories of New Zealand birds, E. F. STEAD (*London: Search Pub. Co.*, 1932, pp. XVI+162, pls. 93).—This account is based upon observations by the author.

Pheasant rearing by the open range system, H. M. WIGHT (*Amer. Game*, 22 (1933), No. 1, pp. 9, 10, 11, 12, fig. 1).—This report is based upon work conducted in Michigan.

Preliminary report on some Minnesota lakes and their productiveness of fish food, M. S. JOHNSON (*Minnesota Sta. Tech. Bul.* 90 (1933), pp. 31).—The work reported, which was conducted with a view to correlating the physical and chemical conditions in Minnesota lakes with the kinds and abundance of bottom fauna and other small animal life and to correlate these with the yield of fish, presents first an introductory account of the study, followed by a discussion of the physiography of some groups of Minnesota lakes and the bottom fauna of such lakes. Details of the investigation, the field work with which extended over four summers, 1926–29, are presented in tabular form under the headings of (1) summary of physical and chemical data obtained in a survey of groups of Minnesota lakes and (2) bottom fauna of eight small lakes near St. Paul.

The importance of the investigation is emphasized by the fact that the State probably contains a larger number of lakes than any other in the Union, numbering some 10,000, and covering nearly 7 percent of the entire area of Minnesota. Seventy-four lakes have been included, these being considered typical of the fertile-land lakes of the State. Thus far the lakes of the rock-outcrop region of northern Minnesota have not been reached in the survey.

A list is given of 11 references to the literature.

The intestinal parasites occurring in fur-bearing animals [trans. title], G. HÜLPHERS (*Skand. Vet. Tidskr.*, 23 (1933), No. 3, pp. 133–154, figs. 16; *Eng. abs.*, pp. 153, 154).—An account is given of the parasites occurring most frequently in fur-bearing animals, and more especially those found in Sweden, such as coccidia, mawworms, hookworms, whipworms, lungworms, tapeworms, and trematodes.

The identification of lungworms that infest fur bearers [trans. title], W. NÖLLER and F. SCHMID (*Ztschr. Wiss. Biol., Abt. F, Ztschr. Parasitenk.*, 4 (1932), No. 4, pp. 737–747, figs. 16).—This account includes a list of 63 references to the literature.

A preliminary report on a survey of animal parasites of Canton, China, rats, H. T. CHEN (*Lingnan Sci. Jour.*, 12 (1933), No. 1, pp. 65–74).—An account of a survey made of the parasites of *Mus norvegicus* Erxl. and *M. rattus* L. in Canton during the year October 1931 to November 1932, in which 84 rats were examined.

A helminthological survey of Southern Rhodesia, W. K. BLACKIE (*London School Hyg. and Trop. Med. Mem.* 5 (1932), pp. IX+91, pls. 7, figs. 2).—This report gives the results of an investigation into the relationship of the parasitic helminths to human disease, conducted from May 1930 to February 1931.

The longevity of parasitic worms, with special reference to a report of the occurrence of *Diectophyme renale* in this country, E. L. TAYLOR (*Vet. Rec.*, 13 (1933), No. 18, p. 407).—The author has here brought together longevity records of 2 species of cestodes, 5 of trematodes, and 5 of nematodes as recorded by various authors.

Life-history of the fowl tapeworm, *Davainea proglottina*, F. J. BROWN (*Nature [London]*, 131 (1933), No. 3304, pp. 276, 277).—This is an account of the status of knowledge of the fowl tapeworm *D. proglottina* as related to its development in the slug *Agriolimax agrestis*. A brief description is given of

the technic adopted in breeding the slugs and their infestation with proglottids. By killing and examining some of the experimental slugs at varying intervals, the route of infection was established and all stages of the development up to and including the cysticercoids were obtained. It is thought probable that there are other intermediate hosts of this tapeworm in Great Britain.

The cestodes infesting birds, O. FUHRMANN (*Les Ténias des Oiseaux. Neuchâtel: Paul Attinger, 1932, pp. 383, figs. 147*).—Following an introduction (pp. 1–19), the systematic part of this work (pp. 21–180) presents descriptions of families and genera, genotypes being indicated. A host list systematically arranged (pp. 181–326), a list of the new genera (3) and species (6), a 25-page bibliography relating to avian cestodes, an alphabetical index to orders of avian parasites, and an index to the specific, generic, and family names with their synonyms, respectively, follow.

The coccidia of the peacock [trans. title], W. L. YAKIMOFF, W. F. GOUSSEFF, and I. L. MATIKASCHWILI (*Ztschr. Wiss. Biol., Abt. F, Ztschr. Parasitenk., 4 (1932), No. 4, pp. 748–752*).—In experiments made with peacocks in the zoological gardens of Tashkent and Leningrad in 1931 two types of coccidia were found which apparently represent the forms *Eimeria tenella* R. & L. and *E. mitis*.

Contribution to the knowledge of the species of Oesophagostomum of Primates [trans. title], L. TRAVASSOS and E. VOGELSANG (*Mem. Inst. Oswaldo Cruz, 26 (1932), No. 3, pp. 251–328, pls. 37, fig. 1*).—A synopsis of the members of this genus of parasitic nematodes that affect Primates is presented in connection with a bibliography of 13 pages. One new species is described and a subgenus is erected. A host list of all the species of the genus is included.

Antony van Leeuwenhoek and his "little animals", C. DOBELL (*London: John Bale, Sons & Danielsson, 1932, pp. VII+435, pls. 32, figs. 4; rev. in Vet. Rec., 13 (1933), No. 16, p. 364*).—An account of the life and work of the father of protozoology and bacteriology.

Textbook of entomology, H. WEBER (*Lehrbuch der Entomologie. Jena: Gustav Fischer, 1933, pp. XII+726, figs. 555; rev. in Ent. News, 44 (1933), No. 6, pp. 166–168*).—The first part of this work deals with the skeleton and the musculature (pp. 1–250); part 2 with the nervous system and the sense organs (pp. 251–341); part 3 with the interaction of the sense organs, the nervous system, and the effectors (pp. 342–362); part 4 with the organs of metabolism (pp. 363–473); part 5 with reproduction and development (pp. 474–593); and part 6 with insect ecology (pp. 594–640). Part 7 consists of a review of the classification of insects (pp. 641–681). A classified bibliography (pp. 682–697) and an index (pp. 698–726) are included. The review is by R. E. Snodgrass.

The problems of insect study, P. KNIGHT (*Ann Arbor, Mich.: Edwards Bros., 1933, pp. [3]+118, pls. 23, fig. 1*).—This is a practical compilation of information relating to applied entomology.

The senses of insects, H. ELTRINGHAM (*London: Methuen & Co., 1933, pp. IX+126, figs. 25*).—This is a small pocket handbook which presents the subject in 10 chapters in connection with a bibliography of 7 pages.

The acceleration of development of insects by parasitism, G. C. VARLEY and C. G. BUTLER (*Parasitology, 25 (1933), No. 2, pp. 263–268*).—Cases of accelerated development of insects due to parasitism are presented in connection with a review of the literature, two new cases being recorded. The phenomenon is discussed in the light of Roubaud's theory of the diapause (*E.S.R.*, 57, p. 657).

[Control work with the codling moth and San Jose scale in the Northwest] (*Better Fruit, 27 (1933), No. 8, pp. 1, 3, 4, 5–7, 9, 15, fig. 1*).—Contributions relating to control of the codling moth and San Jose scale include the

following: Efficient Control of the Codling Moth, by E. J. Newcomer, F. P. Dean, and A. R. Rolfs (pp. 1, 3, 4); Spray Recommendations for Codling Moth Control in Washington for 1933 (pp. 5, 15); Suggestions for Use of Oil Sprays in 1933 (pp. 6, 7); and Inventory of the 1932 San Jose Scale and the Codling Moth Situation in Idaho, by W. H. Wicks (p. 9).

Connecticut State entomologist, thirty-second report, 1932, W. E. BRITTON (*Connecticut State Sta. Bul.* 349 (1933), pp. 365-460+XIX-XXIV, figs. 23).—Entomological Features of 1932, including the insect records for 1932, by Britton (pp. 369-381); Inspection of Nurseries in 1932 (pp. 383-392) and Inspection of Imported Nursery Stock (pp. 392, 393), by Britton and M. P. Zappe; Inspection of Apiaries, 1932, by Britton (pp. 394-399); Report on Gipsy Moth Control in Connecticut in 1932, by Britton and J. T. Ashworth (pp. 400-407); European Corn Borer Control, 1932, by Britton, Zappe, and J. P. Johnson (pp. 407-411); and The Japanese Beetle in Connecticut in 1932, by Britton and Johnson (pp. 411-415), are first presented. The spread of the satin moth is briefly referred to by Britton (pp. 415, 416). Then follow reports of studies of the imported currant worm, by B. H. Walden (pp. 416-427); the oriental fruit moth parasite work, by P. Garman (pp. 427-429); seasonal life history of the white apple leafhopper (*Typhlocyba pomaria* McAtee) and experiments in its control, by Garman and J. F. Townsend (pp. 429-432); notes on the comparative toxicity of anabasine sulfate and nicotine sulfate for aphid and leafhoppers, by Garman (pp. 433, 434); injury by a weevil from the Orient, *Pseudocneorrhinus setosus* Roelofs (pp. 434-437) and a leaf miner of red cedar and arborvitae, *Argyresthia freyella* Wals. (pp. 437, 438), both by Britton; mosquito control in Connecticut, 1932, by R. C. Botsford (pp. 439-441); and tests of mosquito light traps and larvicides in 1932, by N. Turner (pp. 441-445). The work concludes with miscellaneous insect notes by different authors (pp. 445-458) and a list of publications by the entomological department during the year.

In the parasite control work with the oriental fruit moth (pp. 427, 428), 18,000,000 individuals of *Trichogramma minutum* and *T. pretiosa* and 9,500 of *Macrocentrus ancylovorus* were dispatched during the year in 172 shipments to 157 growers, making a total of 35,877,000 *T. minutum* and *T. pretiosa* and 31,836 *M. ancylovorus* shipped to 233 fruit growers during the past 3 years. Observations of the year indicated that a high parasitism by *M. ancylovorus* and a moderate *T. minutum* and *T. pretiosa* parasitism resulted in an infestation much reduced from the preceding year in an orchard in Cheshire and a continued very low infestation in an orchard near Manchester. Field experiments with sulfur continued to indicate that heavy applications shortly after liberation decidedly affect the amount of parasitism by *T. minutum* and *T. pretiosa*. Light applications did not affect the degree of natural parasitism in one field test, it being nearly the same in both treated and untreated areas. Laboratory tests also continued to show that sulfur has a deleterious action on the amount of parasitism, and that talc dust is even more injurious than sulfur dust.

The data on the seasonal history of the white apple leafhopper *Typhlocyba pomaria* (pp. 429-432) are graphically summarized in chart form. The greatest damage to trees during the year was due to leaf stippling, most of the fruit spotting having been washed off by rains in late September. Sprays of nicotine and soap or other combinations were shown to have some residual effect, due to killing eggs within the leaves or to killing nymphs after hatching and feeding on sprayed foliage. A comparison made of nicotine sulfate, 1 pt. to 100 gal. of water, and the same with 3 lb. of soap added, showed no significant

difference in field counts. In small-scale field experiments, anabesine sulfate gave quite as good kill of leafhopper nymphs as nicotine sulfate when used at the same dilution. The parasites *Aphelopus* sp. and *Anagrus armatus* Ashm were again found in 1932.

A comparison of the toxicity of anabesine sulfate and nicotine sulfate for aphids and leafhoppers (pp. 433, 434) showed the former to be about five times as toxic for the bean aphid as the nicotine sulfate when diluted by volume.

The weevil introduced from the Orient, *Pseudocneorrhinus setosus* (pp. 434-437), was observed at West Haven injuring Japanese barberry, California privet, hemlock, and lilac. The weevils had severely injured the trees by eating off the new and tender growth, and there were some severed tips on the ground due to their ravages.

[Contributions on economic insects] (*Mich. State Hort. Soc. Ann. Rpt.*, 62 (1932), pp. 14, 50-54, 74-78, 100, 101).—Contributions presented at the annual meeting of the society in 1932 include the following: San Jose Scale, by R. Hutson (p. 14); Controlling Codling Moth in Michigan Orchards, by F. Sherman III (pp. 50-54); and Control of Aphids on Fruit Trees (pp. 74-78) and The Present Status of Oriental Fruit Moth in Michigan (pp. 100, 101), both by R. Hutson.

[Studies on insects and their control in Nebraska] (*Nebraska Sta. Rpt.* [1932], pp. 19-21).—Brief reference is made to the control of the Hessian fly, and to a brood study of the codling moth in southeastern Nebraska.

[Contributions on economic insects] (*Ohio Veg. Gowers' Assoc. Proc.*, 18 (1933), pp. 66-72, 139-142).—The proceedings include a Progress Report on Wireworm Investigations, by H. L. Gui, and Progress in Bean Insect Control, by N. F. Howard.

[Contributions on economic entomology] (*Quebec Soc. Protect. Plants Ann. Rpt.*, 23-24 (1930-32), pp. 20-118, 131-168, 170-172, figs. 15).—The contributions presented at the twenty-third and twenty-fourth annual meetings of the society (E.S.R., 66, p. 448), held at Macdonald College, Que., in April 1931 and April 1932, include the following: The Effect of Some Physical Factors on Onion Maggot Infestations in Light and Heavy Soils, by A. G. Dustan (pp. 20-27); The Overwintering Habits of the Tarnished Plant Bug, *Lygus pratensis* Linn., in the Ottawa District, by R. H. Painter (pp. 28-31); The Gladiolus Thrips [*Taeniothrips gladioli* M. & S.] and Its Control, by A. G. Dustan (pp. 32-37); Technique and Methods in the Study of Climatic Factors in Connection with Biological Investigations, by J. J. de Gryse (pp. 38-86); A Modification of the Stoughton Constant Temperature-Humidity Chamber, by J. R. G. Sutherland (pp. 87-96); The Grape Mealybug (*Pseudococcus maritimus* Ehrhorn), by W. Dickison (pp. 97-104); Some Observations on the Common Mealybug, *Pseudococcus citri* Risso, by J. R. G. Sutherland (pp. 105-118); The Carpenter Worm (*Prionoxystus robiniae* Peck) and Its Control, by C. E. Petch and J. B. Maltais (pp. 131-136); Mosquito Investigations in Canada during 1931, by A. Gibson (pp. 137-148); Summary of Insect Conditions in Canada in 1930, by C. R. Twinn (pp. 149-168); and The Pine Shoot Moth, *Rhyacionia (Evetria) frustrana* Comstock, in the Province of Quebec, by L. Daviault (pp. 170-172).

Sixty-second annual report of the Entomological Society of Ontario, 1931 (*Ent. Soc. Ontario Ann. Rpt.*, 62 (1931), pp. 98, figs. 12).—In addition to the reports on the insects of the season 1931 (E. S. R., 66, p. 347) for Ontario, by W. A. Ross and L. Caesar (pp. 7-14); Nova Scotia, by F. C. Gilliatt (pp. 14-17); New Brunswick, by R. P. Gorham, G. P. Walker, and L. J. Simpson (pp. 17-20); southern Quebec, by C. E. Petch (pp. 20-22); the Quebec district,

by G. Maheux (p. 23); Manitoba, by A. V. Mitchener (pp. 24-26); Saskatchewan, by K. M. King and A. P. Arnason (pp. 27, 28); the Prairie Provinces, by K. E. Stewart (pp. 29, 30); southern Alberta, by H. L. Seamans (pp. 30, 31); northern Alberta, by E. H. Strickland (pp. 31, 32); and British Columbia, by E. R. Buckell (pp. 32-34), the following contributions are listed: Some Notes on the Cyclamen Mite (*Tarsonemus pallidus* Banks), a Pest of Strawberry Plants, by A. G. Dustan and W. G. Matthewman (pp. 34-37); The Black Vine Weevil (*Brachyrhinus sulcatus* Fab.) Attacking Japanese Yew, by R. W. Thompson (pp. 37-39); History of the Oriental Fruit Moth Infestation in Niagara Peninsula, by W. A. Ross (pp. 40-43); Chrysopids as a Factor in the Natural Control of the Oriental Fruit Moth, by W. L. Putman (pp. 44, 45); Control Measures for Apple Tree Borers [Flat-Headed Apple Tree Borer], by R. Hutson (pp. 46, 47); Observations on the Trapping of Apple Maggot Flies, by J. Marshall (pp. 47, 48); The Apple and Thorn Skeletonizer (*Simaethis pariana* Clerck), by L. Caesar (pp. 48, 49); The Status of Lubricating Oil Sprays in Ontario, by W. A. Ross (pp. 49-57); The Brown-Headed Spruce Sawfly [Yellow-Headed Spruce Sawfly], *Pachynematus ocreatus* (Harr.) Marlatt, by A. V. Mitchener (pp. 57-61); *Dreyfusia piceae* (Ratz.) and Its Relation to "Gout Disease" in Balsam Fir, by E. R. Balch (pp. 61-65); The Parasites of the Oriental Fruit Moth (*Laspeyresia molesta* Busck) in Ontario in 1931, by W. E. Van Steenburgh (pp. 66-69); Observations on the Outbreak of Sod Webworms during the Season of 1931, by G. M. Stirrett and D. A. Arnott (pp. 69-75); Observations on the Outbreak of Green Clover Worm Attacking Beans during the Season 1931, by G. M. Stirrett (pp. 75-82); Notes on the Onion Maggot (*Hylemyia antiqua* Meigen), by E. W. Kendall (pp. 82-84); Notes on *Taeniothrips gladioli* Moulton and Steinweden, by A. G. Dustan and W. G. Matthewman (pp. 84-87); Notes on Control Substances for Sowbugs, by R. W. Thompson (pp. 87-89); The European Corn Borer Situation in Ontario in 1931, by L. Caesar (pp. 89-91); and Myiasis in Ranch Raised Foxes, by A. A. Kingscote (pp. 91-93).

Report of the entomologist, R. W. E. TUCKER (*Barbados Dept. Sci. and Agr. Rpt. 1930-31, pp. 80-97, pls. 7*).—This report deals particularly with the sugar cane borer and the technic of breeding the egg parasite *Trichogramma minutum*, together with the results of two years' field liberations of this parasite in Barbados, the account being presented in connection with a list of 64 references to the literature. This is followed by brief accounts of control work with the cane root borer *Diaprepes abbreviatus* L., the silky cane weevil, the pink bollworm, army worms, and defoliators, and the sweetpotato weevil *Euscepes batatae* Waterh.

An annotated bibliography of Puerto Rican entomology, M. D. LEONARD (*Jour. Dept. Agr. Puerto Rico, 17 (1933), No. 1, pp. 96*).—This contribution from the Puerto Rico Insular Experiment Station brings together published references to the entomology of Puerto Rico, 711 titles in all, the arrangement being by authors.

Report of the entomological division for the year 1931, F. A. SQUIRE (*Brit. Guiana Dept. Agr., Div. Rpts. 1931, pp. 113-115*).—A brief account of the insects of the year, presented under the headings of the principal crops affected (E.S.R., 66, p. 347).

[Report of the division of entomology], D. T. FULLAWAY (*Hawaii. Forester and Agr., 30 (1933), No. 1, pp. 54-59*).—This report for the biennium 1931-32 deals particularly with insect pest control work.

Annual report of the Government entomologist, H. HARGREAVES (*Uganda Dept. Agr. Ann. Rpt. 1931, pt. 2, pp. 43-58*).—The occurrence of, and control

work of the year with, locusts and insects affecting cotton and several other crops are briefly reported, followed by an extended account of mosquitoes and their control.

Controlling plant pests in southern Africa, edited by H. E. ANDRIÉS (*Johannesburg: Cooper & Nephews, 1932, pp. [10]+215, figs. 160*).—This work, dealing with both economic insects and plant diseases, includes a chapter (pp. 23–98) on the principal insect pests and their control.

Insects of important crops during 1931, G. H. CORBETT (*Straits Settlements and Fed. Malay States Dept. Agr., Gen. Ser. No. 12 (1933), pp. 41–47*).—A brief account of the occurrence of the more important pests of 1931 (E.S.R., 67, p. 426).

Bibliography of Australian entomology, 1775–1930, with biographical notes on authors and collectors, A. MUSGRAVE (*Sydney: Roy. Zool. Soc. N.S. Wales, 1932, pp. VIII+380*).—Complete lists are given of papers of authors who have worked on the insect fauna of Australia. Information concerning the authors, collectors, expeditions, collections and types in Australian museums, journals, etc., and a subject index are included.

[Report of work in entomology], J. MUGGERIDGE (*New Zeal. Dept. Agr. Ann. Rpt. 1931–32, pp. 44–46*).—A brief report of work with economic insects in New Zealand, and particularly spray experiments.

Chilean insect parasites for New Zealand (*Nature [London], 131 (1933), No. 3304, pp. 283, 284*).—This is a record of the introduction of the Chilean sawfly *Antholcus varinervis* into New Zealand to attack important weeds of the genus *Acaena*, the burs of which are a source of loss to wool growers, and of *Elaphroptera dimidiata* to attack cockchafer larvae.

The more important insect pests of cacao, tobacco, and dried fruit, G. V. B. HERFORD (*Bul. Imp. Inst. [London], 31 (1933), No. 1, pp. 39–55, pl. 1*).—A digest on the more important pests of these products.

Insect pests of grain in Alberta, E. H. STRICKLAND (*Alberta Univ. Col. Agr. Bul. 24 (1933), pp. 58, figs. 11*).—A practical compilation of information on the insect pests of grain in Alberta.

Investigations of the insect enemies of peas in the Canton of St. Gallen in the Rhine Valley during 1931 and 1932 [trans. title], H. KUTTER and W. WINTERHALTER (*Landw. Jahrb. Schweiz, 47 (1933), No. 3, pp. 273–338, figs. 63; Fr. abs., p. 322*).—This contribution deals with studies of the pea thrips (*Kakothrips robustus* Uzel) and the pea gallfly (*Contarinia pisi* Winn.), their natural enemies and means of control, in the Rhine Valley of Switzerland in 1931 and 1932.

The potato flea beetles (*Epitrix cucumeris* Harris, *Epitrix subcrinita* Leconte), A. J. HANSON (*Washington Col. Sta. Bul. 280 (1933), pp. 27, figs. 13*).—This is a general account of the potato flea beetle and the western potato flea beetle in Washington, together with a report of studies which supplement the information presented by Webster, Baker, and Hanson in Bulletin 261 (E.S.R., 67, p. 578).

In Washington there is one generation and a partial second generation annually. The overwintering adults emerge from hibernation during May and June. The majority of the adults of the new generation emerge from the ground in the period from July 25 to August 17. A gradual increase in the number of adult flea beetles occurs in the potato field throughout June and in the early part of July, a rapid increase occurs in late July and early August, and a decline starts around August 25 and continues throughout September and October. Complete disappearance takes place in early November. Accompanied by the increase of the flea beetle population is a greater amount

of injury on the potato foliage. Under heavy infestation plants may be killed during August. The greatest amount of tuber injury occurred on those potatoes planted in the period from April 19 to June 1. Most of the larval injury on the tubers is accomplished during the latter part of July.

Rhizoctonia and scab become more serious with the flea beetle injury. Crop rotation and seed treatment are even more essential under these conditions. Eight varieties of potatoes grown under the same field conditions showed a variation in the amount of injury on the tubers. Gold Coin had the least injury, while Beauty Hebron was the most severely affected. The most efficient insecticides for flea beetles were dusts composed of calcium arsenate and lime (1-4) and barium fluosilicate and diatomaceous silica (1-1). Bordeaux mixture and calcium arsenate were the most effective combination that included an arsenical poison.

The P.O.J. canes and insect damage, U. C. LOFTIN (*Asoc. Téc. Azucareros Cuba, Proc. Ann. Conf.*, 4 (1930), pp. 52-58).—It is concluded from the observations thus far made that the insect damage to cane in Cuba is reduced by the planting of P.O.J. cane. Even in the instances where an increased infestation seems to have occurred, as in the case of the sugarcane borer, the increased yield of cane gives a much larger margin to offset the loss.

Tobacco insects in 1932, D. S. LACROIX (*Connecticut State Sta. Bul.* 350 (1933), pp. 488-499, figs. 5).—After briefly reporting upon the prevalence of various species of insects in the State in 1932, work with the potato flea beetle, tobacco budworm, and tarnished plant bug is referred to, followed by accounts of the distribution of wireworm larvae in tobacco soil, insecticide tests against wireworms, and control of the tobacco thrips.

The animal enemies of tobacco in Deli [trans. title], J. C. VAN DER M. MOHR (*Meded. Deli Proefsta. Medan*, 2. ser., No. 81 (1932), pp. 94, pls. 43, figs. 9).—In this account particular attention is given the insect enemies of tobacco in Deli.

Two lesser known pests of peaches, R. HUTSON (*Michigan Sta. Quart. Bul.*, 15 (1933), No. 4, pp. 221-224, figs. 4).—A brief practical account of the green stinkbug and the peach leaf silver mite.

Observations on citrus insects and their control in many parts of the world, I-IX, F. S. BODENHEIMER (*Hadar*, 4 (1931), Nos. 10, pp. 220-223; 11, pp. 251-254, figs. 2; 12, pp. 278-280, fig. 1; 5 (1932), Nos. 1, pp. 6-9; 2, pp. 32-35, fig. 1; 5, pp. 112-116, figs. 3; 7, pp. 164-166; 8, pp. 184-187, figs. 2; 9, pp. 209-212; 10, pp. 232-236, figs. 2; 11, pp. 256-260, figs. 2).—The several parts of this contribution deal with (1) a survey of entomological California, (2) the citrus insect problems of California, (3) biological control in California, (4) technical control in California, (5) plant quarantine in California, (6) some notes on the Florida citrus pests with special reference to the Mediterranean fruit fly eradication campaign in Florida, (7) observations on citrus insects in Hawaii, (8) observations on citrus insects in Japan, and (9) observations on citrus insects in Ceylon.

A list of the principal insect pests of citrus in Brazil [trans. title], J. PINTO DA FONSECA and M. AUTUORI (*Rev. Ent.*, 2 (1932), No. 2, pp. 202-216).—This is an annotated list of the insect pests of citrus, the arrangement being in systematic order.

The citrus insects of tropical Asia, C. P. CLAUSEN (*U. S. Dept. Agr. Circ.* 266 (1933), pp. 36).—This contribution is based upon information assembled during a period of 13 years while engaged in investigations of various biological control problems in the Far East. The account deals primarily with those species attacking citrus in the Philippine Islands, Siam, Malaya, the Netherland

East Indies, Burma, India, and Ceylon. It is pointed out that the author's investigations have been extensive in Malaya, Java, and Sumatra, but only occasional in China, the Philippine Islands, and India.

Approximately 200 species of insects are here listed as attacking citrus in tropical Asia, by far the greater number of which are scale insects. The account is presented in connection with a list of 25 references to the literature.

Tables for the identification of pine and larch insects by their feeding habits, R. KOCH (*Tabellen zur Bestimmung Schädlicher Insekten an Kiefer und Lärche nach den Frassbeschädigungen*. Berlin: Paul Parey, 1913, pp. VIII+207, figs. 217. *Bestimmungstabellen der Insekten an Kiefer und Lärche nach den Frassbeschädigungen*. Berlin: Paul Parey, 1932, 2 ed., rev., pp. VI+218, figs. 247).—This volume is a companion of that relating to insect enemies of spruce and fir, previously noted (E.S.R., 31, p. 155).

Prevention and control of damage by wood-boring insects, R. C. FISHER (*Forestry*, 6 (1932), No. 1, pp. 67-74).—This discussion is presented in connection with a list of 19 references to the literature.

Insecticidal studies of midcontinent distillates as bases for pyrethrum extracts: Household sprays, H. H. RICHARDSON (*Indus. and Engin. Chem.*, 24 (1932), No. 12, pp. 1394-1397).—This is a report of an investigation conducted with a view to determining which fractions of petroleum distillates are most efficient for use in the preparation of pyrethrum extracts. It appears that distillates in the higher boiling range (378°-516° F. or 192.2°-268.9° C.) are most toxic. Short-cut fractions varying in distillation range between 398° and 500° F. (203.3° and 260° C.) are found to be equally efficient as the longer range fractions, but the latter should be more suitable from an industrial standpoint. A distillate refined by the Edeleanu process shows little difference in insecticidal effect from that refined by the usual method. The long-range distillate that is most efficient when tested alone is also found to give the most efficient extracts of pyrethrum.

Field spraying with undiluted paraffin extracts of pyrethrum against *Antestia* and *Lygus* on coffee in Kenya, R. H. LE PELLEY (*Bul. Ent. Res.*, 24 (1933), No. 1, pp. 1-32, fig. 1).—The application of an undiluted paraffin extract of pyrethrum for controlling *A. orbitalis* Westw. *lineaticollis* Stål and the common coffee capsid bug *L. simonyi* Reut. on coffee trees, applied at the rate of 20 cc of extract per tree as a spray under a cloth cover, is described. The mortality of *Antestia* resulting from the most favorable method was 99 percent, a kill of coffee borers not much below 95 percent being possible in practice. Of the *Lygus* on trees sprayed, 99 percent were brought down and the kill was complete.

The occurrence of rotenone and related compounds in the roots of *Cracca virginiana*, E. P. CLARK (*Science*, 77 (1933), No. 1995, pp. 311, 312).—The author reports having found in the course of work now under way that ether extraction of the roots of *C. virginiana*, the most abundant species of the genus indigenous to the United States, yielded from 4 to 6 percent of resinous materials having a pleasant characteristic odor, which, when tested as a fish poison, showed essentially the same toxicity as pure rotenone. "It contained 9 percent methoxyl and in many ways resembled the noncrystallizable extractives from derris and cubé roots. Attempts to obtain individual major constituents by distillation, crystallization, or the formation of derivatives were for the most part unsuccessful, although four substances were obtained in small quantities. These were rotenone, dehydrorotenone, tephrosin, and a colorless crystalline material, $C_{22}H_{24}O_4$, whose m.p. is 131°. . . . This is the first native plant of the United States in which members of the rotenone group of fish poisons have been found."

Some results from feeding spray chemicals to albino rats, T. J. TALBERT and W. L. TAYLOR (*Missouri Sta. Res. Bul. 183 (1933), pp. 19, figs. 2*).—Limitation by the Federal Government of foreign and interstate shipments of fruits and vegetables to such as contain arsenical residue with not more than 0.01 grain of arsenic trioxide per pound of fruit led to the work here reported, conducted with a view to obtaining experimental evidence of the toxicity of chemical sprays. Arsenic as arsenic trioxide or in combination with lead in the form of commercial lead arsenate, or with calcium arsenate and lead acetate, appears to affect albino rats as follows:

“Arsenic salts in quantities ranging from the equivalent of 4 times to 200 times the official world tolerance may promote activity and growth in the original stock for the first 23 to 25 weeks. Dosages of insecticides continued for periods of more than 15 weeks decrease the ability to raise young in the first generation. Arsenic did not appear to retard growth unless fed in quantities larger than the equivalent of 0.04 grain arsenic trioxide per pound of fruit. Lead as lead acetate and arsenic in its various forms as an insecticide appear to have injurious effects on albino rats only after prolonged feeding. Arsenic or lead, or both, when fed in quantities larger than the equivalent to 0.04 grain for about 175 days seemed to have an injurious effect on the offspring by decreasing the weight and the ability of the females to produce and rear young.

“When spray chemicals are fed daily over long periods in quantities equivalent to more than 4 times the world tolerance, they have very marked injurious effects on albino rats, and when the feeding is extended for 400 days or more the mortality rate increased and amounted to as much as 35.4 percent. Contrary to general opinion, the spray insecticides do not have as acute toxic effects on albino rats as is generally supposed, even when used in amounts of 200 times the official world tolerance. Our experience indicates that the arsenicals in fruit sprays have, in fact, acute stimulating effects, and injurious effects are brought on only when feeding is regular and prolonged, as shown in the feeding periods ranging from 378 to 497 days.

“If it may be assumed that the spray chemicals have an effect upon man similar to that which they have upon albino rats, it is the opinion of the authors that there is little likelihood of a human consuming as spray residue on apples, sprayed and handled in the usual manner, enough arsenic either at one time or over an extended period to be injurious.”

Because of the varying effects of lead arsenate recorded by other investigators, it is thought that further work should be conducted before definite conclusions can be drawn as to the risk of lead poisoning from consumption of sprayed apples.

A possible biological control of the clover springtail or lucerne flea (*Sminthurus viridis* L.) in Western Australia, H. WOMERSLEY (*Jour. Council Sci. and Indus. Res. [Aust.], 6 (1933), No. 2, pp. 83-91, pl. 1*).—The author reports that a bdellid mite, *Biscirus lapidarius* Kram., possibly introduced from Europe, has made its appearance in paddocks infested with *S. viridis* in certain areas of Western Australia and become an active predator of this pest. This has resulted in the reduction of the population of *S. viridis* to negligible proportions within a comparatively short time. The transportation of *B. lapidarius* to other areas is said to have been partially successful. The immature stages and partial life history of the mite are described and figured.

Experiments on the control of the greenhouse symphylid (*Scutigerella immaculata*), H. G. H. KEARNS and C. L. WALTON (*Jour. Bath and West and South. Counties Soc., 6. ser., 7 (1932-33), pp. 170-174*).—The authors find that

steam sterilization of the soil gives satisfactory results against *S. immaculata* provided the pest is within the layer of soil that can be effectively steamed. In case the subsoil is open and porous the symphylids will hibernate to considerable depths below the soil and must be attracted from the subsoil before steaming is commenced, and a combination of heating the houses and growing an attractant crop, such as lettuce, is suggested as a suitable means. The boiler of the steam sterilizing plant should be of ample size to maintain a pressure of 80 lb. for 20 minutes in the grid submerged at a depth of 1.5 ft. from the surface of the soil. A boiler of not less than 20 h.p. is strongly recommended when a number of large houses are treated each year.

The association of the termites, *Kaloterms minor*, *Reticulitermes hesperus*, and *Zootermopsis angusticollis* with fungi, E. C. HENDÉE (*Calif. Univ. Pubs. Zool.*, 39 (1933), No. 5, pp. 111-133, fig. 1).—In the author's studies fungi were found associated with each of the 15 colonies of *K. minor* Hagen, 12 colonies of *R. hesperus* Banks, and 12 colonies of *Z. angusticollis* Hagen.

Notes on the habits of injurious grasshoppers in Manitoba, N. CRIDDLE (*Canad. Ent.*, 65 (1933), No. 5, pp. 97-102, fig. 1).—A report of observations, presented in connection with a list of five references to the literature.

Food plants and distribution of some Utah Thysanoptera, G. F. KNOWLTON and W. L. THOMAS (*Canad. Ent.*, 65 (1933), No. 5, pp. 114-117).—This contribution from the Utah Experiment Station lists the food plants and distribution of 22 forms which occur in the State.

Biology and life history of *Limothrips cerealium* Haliday and *Aptinotrips rufus* Gmelin feeding on Gramineae, U. S. SHARGA (*Ann. Appl. Biol.*, 20 (1933), No. 2, pp. 308-326, pl. 1, fig. 1).—This is an account of studies at Edinburgh of the life history, habits, and natural enemies of *L. cerealium*, which feeds on wheat and oats and various meadow grasses in spring and summer, and of *A. rufus*, a common grass-inhabiting species, in Great Britain. An internal nematode parasite was found in *A. rufus* which causes sterility in almost all cases. A list is given of 29 references to the literature.

Some preliminary tests on the control of *Thrips imaginis* Bagnall, J. W. EVANS (*Jour. Council Sci. and Indus. Res. [Aust.]*, 6 (1933), No. 2, pp. 99-102).—Work conducted in the spring of 1932, in which tests were made of repellents or deterrents for thrips, included several sprays and the three dusts, nicotine, sulfur, and pyrethrum. Pyrethrum powder was the only substance tested which was of value. Even when mixed with sulfur in the proportions of 1 part of pyrethrum to 10 parts of sulfur, it was shown to retain its strength as a repellent for two days.

Biology and control of the onion thrips (*Thrips tabaci* L.) [trans. title], C. J. H. FRANSSSEN and W. C. VAN HEURN (*Dept. Landb., Nijv. en Handel [Netherland East Indies], Korte Meded. Inst. Plantenziekten*, No. 18 (1932), pp. 20, fig. 1, Eng. abs. p. 20; also in *Landbouw [Buitenzorg]*, 8 (1932), No. 5, pp. 301-320, Eng. abs. p. 320).—This is an account of a study of the onion thrips, which has been found in Java on several cultivated plants, but is causing serious damage only to the onion crop during the dry season.

The box elder bug as a household pest, E. I. McDANIEL (*Michigan Sta. Quart. Bul.* 15 (1933), No. 4, pp. 226, 227).—It is pointed out that during the last three seasons the boxelder bug has steadily increased in numbers and in many localities in the State has become a nuisance in and about houses during the late fall and early winter. Other than as a source of annoyance the bug is harmless as a source of damage in the house, and the elimination of boxelders in the vicinity of houses should serve as an adequate control.

Field observations on the beet leafhopper (*Eutettix tenellus*) in California, H. H. P. SEVERIN (*Hilgardia* [*California Sta.*], 7 (1933), No. 8, pp. 281-360, pls. 8, figs. 23).—This is a report of studies of the beet leafhopper carried on in cooperation with the U.S.D.A. Bureau of Entomology in continuation of the work previously noted (E.S.R., 41, pp. 456, 755; 59, pp. 642, 644; 61, p. 242), presented under the headings of distribution, breeding areas, host plants, dispersal and migration, natural barriers, fluctuations in population, and natural enemies.

The author reports having found a natural breeding ground to occur in Honey Lake Valley at an altitude of about 4,000 ft. in the Sierra Nevada. It was also found in the Sierra Valley. The beet leafhopper was taken on 20 species of food plants growing on the uncultivated plains and foothills, 5 of which belong to the Chenopodiaceae, to which the sugar beet belongs. The nymphs were bred from eggs deposited in 8 different species of plants under natural conditions. Red-stem alfalfa is the most important host plant upon which the overwintering adults feed and deposit their eggs and upon which the spring generation develops. When the beet leafhopper is abundant it occurs on most weeds and a large number of economic plants. Nymphs have been bred from eggs deposited in 46 different annual and perennial plants growing in the cultivated areas; 19 of these breeding plants belong to the Chenopodiaceae and the remainder to 12 other families. The range of the leafhopper is said to correspond to the geographical distribution of the saltbushes.

The spring dispersal of the leafhopper from the uncultivated plains and foothills occurs after the pasture vegetation becomes dry and is probably associated with a food stimulus, the insects invading the cultivated areas when the annual saltbushes and other weeds are succulent and most favorable from the standpoint of food and egg deposition. A spring migration of the leafhopper occurs from the cultivated areas of the San Joaquin into the Sacramento Valley, a distance estimated at about 60 miles, and successive northward migrations of about 150 miles followed the cultivated areas of the Sacramento Valley. The dispersal of the summer generation from badly diseased beets to healthy beets is known to extend at least 3 miles in the Sacramento Valley. The autumn dispersal from the cultivated areas to the uncultivated plains and foothills in the San Joaquin and Salinas Valleys occurs during October, November, and December.

“The most important natural barrier of the beet leafhopper is rainfall, which reduces the population on the northern foothills of the San Joaquin Valley. The abundance of rainfall in the Sacramento Valley is the factor that exterminates the overwintering adults on the foothills and in the cultivated areas. Rainfall when above normal reduces the population on the foothills in the Salinas Valley. Fog and possibly low temperatures are limiting factors to the offspring of the migrants when the leafhopper migrates into the coastal regions. Various composite controlling factors, such as high humidity owing to rains and fogs, heavy dew, soil moisture, tall dense filaree, cloudiness, or low temperatures, may play important roles in the survival of the insect during the hatching and molting process. The succession of favorable food plants throughout the season may also be a limiting factor in certain migratory areas of the insect, such as the middle and northern Sacramento Valley. . . .

“Among the natural enemies of the beet leafhopper are a large number of predacious insects which prey upon the nymphs and adults. Seven species of egg parasites, 2 species of *Pipunculus* flies, a *Gonatopus*, and a hairworm were bred by various entomologists in California. In 1919 the percentage of parasitized leafhoppers gradually increased during the summer months and reached

its height during August (35.1 percent). The weak point in the parasitism of the leafhoppers occurred on the uncultivated plains and foothills, where only 4.4 to 8.2 percent were parasitized during the winter and 1 to 1.5 percent during the spring. No information is at hand as to the value of egg parasites on the uncultivated plains and foothills and in the cultivated areas. Fungus diseases reduce the numbers of overwintering leafhoppers and spring migrants in the fog belt in favorable years."

A list is given of 45 references to the literature.

Mosquito bug the cause of stem canker of tea, C. SMEE and R. LEACH (*Nyasaland Dept. Agr. Bul.* 5 (1932), pp. 7, pls. 3).—The authors consider the experiments conducted during the last two years with *Helopeltis bergrothi* Reut. to have proved that the feeding action of this insect on the green shoots of tea is the initial cause of the cankerous appearance on the woody stems, and that the disease is not due to a fungus.

The grape phylloxera, R. VEITCH (*Queensland Agr. Jour.*, 39 (1933), No. 2, pp. 79-83, figs. 7).—The author reports that the grape phylloxera, which was recorded for the first time in Queensland late in 1910 in Enoggera district, reappeared in 1932 in a Pinkenba vineyard, where it was found well established.

Banding for coffee mealy bug control, H. C. JAMES (*Kenya Dept. Agr. Bul.* 24 (1932), pp. 6).—A practical account.

Scale insect honeydew from incense cedar, G. H. VANSSELL (*Amer. Bee Jour.*, 72 (1932), No. 9, p. 364, fig. 1).—This is a brief account of honey produced from the honeydew of a cypress scale, *Xylococcus macrocarpae* (Coleman), which infests incense cedars (*Libocedrus decurrens*) of the Pacific coast occurring at elevations from 2,000 to 7,000 ft. The account is contributed from the U.S. Department of Agriculture and the California Experiment Station, cooperating.

A comparison of *Aonidiella aurantii* and *Aonidiella citrina*, including a study of the internal anatomy of the latter, R. G. NEL (*Hilgardia* [California Sta.], 7 (1933), No. 11, pp. 417-466, figs. 12).—The author reports upon investigations undertaken to determine the actual status of *A. aurantii* (Mask.), officially known as the orange scale, and its so-called variety *A. citrina* (Coq.) and to learn more about the internal anatomy of the Diaspidinae, as certain features are still matters of controversy. Following the account of its history and synonymy and distribution and ecology, the subject is dealt with under the headings of life history observations, breeding experiments, metamorphosis of the male, external morphology, and internal anatomy of *A. citrina*.

The yellow scale *A. citrina* is recognized by the author as a distinct species and not a variety of the orange scale, as a result of evidence based upon a comparative study of its ecology and morphology. "Although not well defined in their distribution, the yellow scale seems to prefer the warmer valleys and foothills of the interior, while the red [orange] is more abundant closer to the coast. The red scale attacks all parts of the host tree, whereas the yellow is limited almost entirely to the leaves and fruit. Reared under similar conditions, the yellow scale completes its life cycle in about 65 days and the red scale in about 60 days, giving an approximate difference of 5 days. Structural differences are noticed in the pygidial fringes of the two scales. Apart from possessing slenderer lobes and minor variations in the median plates, the pygidium of the yellow scale shows the presence of a fourth lobelike process. Differences in color and texture of the scale covering are also noticed.

"In addition to a comparative study of the two species a study was made of the anatomy of *A. citrina*, which is summarized herewith."

A list is given of 31 references to the literature.

Pernicious scale, C. P. VAN DER MERWE (*Union So. Africa Dept. Agr. Bul.* 118 (1932), pp. 11, pl. 1).—A summary of information on the San Jose scale as it occurs in the Union of South Africa. The text is in Dutch and English.

The control of Asterolecanium (the fringed scale of coffee), H. C. JAMES (*Kenya Dept. Agr. Bul.* 23 (1932), pp. 4).—A brief practical account of *A. coffeae* Newst.

Experiments on breeding corn for the control of the European corn borer, M. T. MEYERS (*Ohio State Univ., Abs. Doctors' Diss., No. 5* (1930), pp. 84-102).—The author reports that "significant coefficients of correlation and relatively high regression coefficients were obtained in all experiments between the final borer infestation and the earliness of the crosses. The earlier maturing strains carried the heavier final infestation. This was found to be due to their greater attractiveness as measured by the number of eggs deposited and to a higher rate of larval survival on them from a given number of eggs. Height of the plants at the time of moth flight was significantly correlated with the differences in attractiveness. The early strains tended to be somewhat the taller during the first part of the season, which probably accounted for the greater number of eggs deposited on them. The rate of larval survival seemed to be correlated more directly with morphological or chemical differences associated with differences in the relative stage of development reached by the plants of the different strains during the period of egg hatching and larval establishment as measured by the number of days from planting to silking."

Observations on growth in larvae of Plodia interpunctella Hubn., M. MILES (*Ann. Appl. Biol.*, 20 (1933), No. 2, pp. 297-307, figs. 2).—This is a report of studies on larval growth in four series of the Indian-meal moth obtained from different sources, maintained at 21° C., and fed on walnuts.

The slug caterpillar on abacá (Thosea sinensis Wlk.), its life history and habits as observed in Davao, and suggestions for control, P. SISON (*Philippine Jour. Agr.*, 3 (1932), No. 3, pp. 163-187, pls. 6).—This is a report of studies of *T. sinensis*, the larva of which is destructive to abacá and coconuts. The pest is widely distributed in the Philippine Islands from Luzon to Mindanao, and is present wherever there are coconuts.

Prospects for the control of the sugar cane moth stalk-borer (Diatraea saccharalis Fab.) in Cuba by means of natural enemies, L. C. SCARAMUZZA (*Asoc. Téc. Azucareros Cuba, Proc. Ann. Conf.*, 6 (1932), pp. 87-93).—It is said that parasites actually destroy more than 50 percent of the sugarcane borers in many cane fields in Cuba. The tachinid fly *Lixophaga diatraeae* Tns., known since 1914 to be present in Cuba, is the most important of these parasites because of its abundance and distribution throughout the entire island.

The artificial rearing of this parasite was interrupted by unsettled conditions before any definite results of a practical nature could be obtained. It is considered, however, that the practicability of rearing it by artificial inoculation in large enough numbers to effect borer control in places where it is not naturally well established is clearly shown. "The maximum number of *Lixophaga* maggots in good condition for inoculation that were obtained by the writer from a single fly was 113. Usually 30 to 50 maggots are found in this condition; that is, free from the egg membranae in which the embryo develops, and as many or a larger number are found also mature but yet included in the eggs within the ovarian sac. If these maggots are kept in normal saline solution they will come out of the egg and can be used for inoculation a few hours later, having been preserved in good condition in such a medium for 24 hours at laboratory temperature."

The fall army worm, larger canna leaf roller, and caterpillars of the moth *Utetheisa venusta* Dal. were found unfavorable hosts, but the corn borer *D. lineolata* Walk. was tried with satisfactory results.

The moths of South Africa.—Vol. I, Sematuridae and Geometridae, A. J. T. JANSE (*Durban: E. P. & Com. Ptg. Co., 1932, pp. XI+376, pls. 15, figs. 130*).—The introduction to this first volume (pp. 1–66) takes up the subject of classification—its aim and use; short history of entomology; classification, life history, and morphology of insects; morphology of Lepidoptera; how to study life histories; how to collect specimens; drawing; and classification of Lepidoptera; and gives a systematic list of the families, subfamilies, and tribes of the order Lepidoptera and keys and how to use them. Under the heading of descriptive classification a key is given to the families, subfamilies, and tribes of the Lepidoptera, with special reference to the South African species. One species of Sematuridae and 315 species of Geometridae are recognized, 12 genera being erected and 19 species described as new.

The codling-moth and measures for its control in South Africa, F. W. PETTEY (*Union So. Africa Dept. Agr. Bul. 108 (1932), pp. 36, figs. 10*).—This is a revised edition of Bulletin 9 (E.S.R., 56, p. 660).

Olfactory responses of blowflies, with and without antennae, in a wooden olfactometer, N. E. MCINDOO (*Jour. Agr. Res. [U.S.], 46 (1933), No. 7, pp. 607–625, figs. 4*).—Studies of the olfactory responses of the bluebottle blowfly (*Calliphora erythrocephala* Meig.), green-bottle blowfly (*Lucilia sericata* Meig.), and the black blowfly (*Phormia regina* Meig.), as determined in a wooden olfactometer devised by the author, are here reported.

Materials tested during the course of the work included 10 percent solutions of granulated and brown sugars; various concentrations of carbon dioxide, alcohol, and acetic acid; milk and three of its constituents (lactic acid, lactose, and casein); putrid Hamburg steak, putrid eggs, human feces, human urine, ammonia, and skatole. Fermenting sugar solutions not containing baker's yeast were largely attractive during a 25-day period, whereas solutions containing baker's yeast were repellent during nearly all of the 25-day period. Milk and its constituents and fermented baker's yeast were among the best attractants found, but putrid meat and putrid eggs were the most attractive.

In order to determine whether blowflies smell with their antennae, three series of tests were conducted. In the first series the antennae or parts of antennae of 283 *Calliphora* were pulled off and nine substances were tested. The general average responses, expressed as percentages, were for un mutilated flies, 68.4, and mutilated flies, 68.2. In the second series the antennae of 300 *Phormia* were pulled off. The general average responses were for un mutilated flies, 66.6, and mutilated flies, 67.4. In the third series the antennae of 134 *Calliphora* were pulled off. The average responses were for un mutilated flies, 75.7, mutilated flies, 74.9, and flies with glue on the stumps of the antennae, 74.0. From these results it is concluded that the antennae of blowflies do not carry the olfactory organs.

The sheep blowfly problem in Australia.—Report No. 1, edited by R. J. TILLYARD and H. R. SEDDON ([*Aust.*] *Council Sci. and Indus. Res. Pam. 37 and N.S. Wales Dept. Agr., Sci. Bul. 40 (1933), pp. 136, pls. 6, figs. 15*).—This report is presented in connection with a 5-page list of references to the literature.

A preliminary list of the insects of the Province of Quebec.—Part II, Diptera, A. F. WINN and G. BEAULIEU, rev. and sup. by C. E. PETCH and J. B. MALTAIS (*Quebec Soc. Protect. Plants Ann. Rpt. 23–24 (1930–32), Sup., pp. 100*).—This is a revision of the preliminary list of the Diptera of Quebec (E.S.R., 34, p. 449), which includes detailed distributional records of 1,901 species known

to occur in that Province. The species are arranged alphabetically under each genus, followed by locality, month of capture, and name of collector. An index to families, genera, and subgenera, together with a list of names of collectors and contributors and a list of localities, are included.

On anophelism without malaria around Amsterdam.—IV, The pattern of the dorsal surface of the ova in the two races of *A. maculipennis*, A. DE BUCK and N. H. SWELLENGREBEL (*K. Akad. Wetensch. Amsterdam, Proc.*, 35 (1932), No. 10, pp. 1335–1339, pl. 1, figs. 4).—This contribution is in continuation of those previously noted (*E.S.R.*, 62, p. 455).

***Psila nigricornis* Meig. as a pest of chrysanthemums**, H. G. H. KEARNS and C. L. WALTON (*Jour. Bath and West and South. Counties Soc.*, 6. ser., 7 (1932–33), pp. 168–170, pls. 2).—An account is given of a dipteran closely related to the carrot rust fly, which has been the source of loss of chrysanthemum stools in the Bristol Province (1) through the feeding of the larvae on the roots, which may die for part of their length, and (2) through the formation of a number of longitudinal burrows in the outer portion of the rootstock and first few inches of the stem above soil level. In one nursery in the Bath district in 1932 over 8,000 stools of plants grown in pots were rendered useless for the purpose of propagating cuttings.

If applied before serious damage has occurred, the application of corrosive sublimate, 1 oz. per gallon of hot water and diluted to 10 gal. with cold water, is recommended. Whizzed naphthalene is a cheap repellent and should be applied at the rate of about $\frac{1}{4}$ oz. per 10-in. pot, the application being repeated as soon as the odor begins to decrease, or at about 10-day intervals. The solution should be watered into the pots at the rate of $\frac{1}{2}$ pt. per 10-in. pot, and it is important that the soil is moist before the application is made in order to facilitate penetration.

The potato scab-gnat, *Phyxia scabiei* Hop., H. L. GUI (*Amer. Potato Jour.*, 10 (1933), No. 2, pp. 22–27).—This is a contribution from the Ohio Experiment Station reporting upon *P. scabiei*, which causes a significant loss to potato growers in Ohio every year. "Eight to twelve generations may develop during the growing season at Wooster, Ohio. The insect may overwinter in storage or in the field. Damage may be done to potatoes in storage, to planted seed pieces, and to the tuber crop. Four factors have been found to have a bearing on the control of the insect: Seed treatment, crop rotation, the addition of organic matter to the soil, [and] proper adjustment of the pH value of the soil."

Some Cecidomyidae attacking the seed of *Dactylis glomerata* L. and *Lolium perenne* L., M. E. METCALFE (*Ann. Appl. Biol.*, 20 (1933), No. 2, pp. 327–341).—This is a report upon studies of Cecidomyidae, three species of which have been observed destroying grass seed at Harpenden, two, namely, *Contarinia dactylidis* (H.Lw.) and *Dasyneura dactylidis* n.sp. attacking *Dactylis glomerata*, and *C. lolii* n.sp. attacking *L. perenne*.

Studies of fluctuations in insect populations.—II, The infestation of meadow foxtail grass (*Alopecurus pratensis*) by the gall midge *Dasyneura alopecuri* (Reuter) (Cecidomyidae), H. F. BARNES (*Jour. Anim. Ecol.*, 2 (1933), No. 1, pp. 98–108).—This is the second of a series of papers, of which the first has been noted (*E.S.R.*, 67, p. 352).

The ecological distribution of the crane-flies of northern Florida, J. S. ROGERS (*Ecol. Monog.*, 3 (1933), No. 1, pp. 1–74, figs. 25).—This contribution is presented in connection with a list of 48 references to the literature.

The biology and control of the northern cattle grub (*Hypoderma bovis* DeG.) [trans. title], D. J. BLAGOWESCHTSCHENSKY and E. N. PAWLOWSKY (*Ztschr. Wiss. Biol., Abt. F, Ztschr. Parasitenk.*, 3 (1931), No. 2, pp. 185–204,

figs. 2).—A report of work conducted in Novgorod District of Leningrad Province, where the northern cattle grub is an important cattle pest. A list of 10 references to the literature is included.

On an enzyme from blow-fly larvae (*Lucilia sericata*) which digests collagen in alkaline solution, R. P. HOBSON (*Biochem. Jour.*, 25 (1931), No. 5, pp. 1458-1463, *fig. 1*).—In work at the London School of Hygiene and Tropical Medicine it was found that "the excreta of *Lucilia* larvae contain proteolytic enzymes which digest collagen and elastin but not keratin. The enzyme which digests collagen is produced by the cells of the mid-gut and not by intestinal bacteria, since it occurs in sterile larvae. The excreta digest collagen in alkaline solution, the optimum reaction being at about pH 8.5. With increasing acidity the activity of the enzyme decreases and almost disappears at pH 4. The separate existence of a collagenase has been concluded from adsorption and stability experiments. The collagenase is less stable than the enzymes acting upon gelatin and is adsorbed to a greater extent by charcoal and kaolin."

Trapping Ceratitis (*Cyprus Agr. Jour.*, 28 (1933), No. 1, pp. 17-20).—Demonstrations of the value of trapping in combating the Mediterranean fruit fly have been carried on in the Famagusta area of Cyprus since 1930, many citrus growers there having been convinced of the value of this method.

The biology and control of *Laccoptera chinensis* F. (Coleoptera, Chrysomelidae), W. E. HOFFMANN (*Lingnan Sci. Jour.*, 12 (1933), No. 2, pp. 259, 260, *pl. 1*).—An account is given of a chrysomelid beetle that is at times a serious pest of the sweetpotato throughout Kwangtung Province and also on the Island of Hainan, newly set plants being entirely destroyed by the larvae and adults.

The occurrence of June beetles in Michigan, W. F. MOROFSKY (*Michigan Sta. Quart. Bul.*, 15 (1933), No. 4, pp. 225, 226).—A brief practical account calling attention to the importance of the June beetles.

Hibernation of the Mexican bean beetle in the Estancia Valley, N.Mex., J. R. DOUGLASS (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 7, pp. 579-605, *figs. 15*).—Hibernation studies of the Mexican bean beetle in the Upper Sonoran, Transition, and Canadian Life Zones in relation to the plant associations found therein made during the years 1923 to 1929 are reported upon. The investigation was undertaken to determine, if possible, the relative effects of hibernation material, snowfall coverage, temperature, precipitation, and climatic fluctuation on the overwintering of the beetle.

A comparison of the results shows a consistent relationship between the zones and the percentage survival. The results indicate that the ponderosa pine forest zone is the natural hibernation quarters of the beetle in the Southwest and becomes more favorable when oak trees are present in the association. The accumulation of dust, the character of the hibernation material, snow coverage during subzero weather, and drainage were found to affect the mortality of beetles in hibernation. Elevation considered alone seems to have no significance within the zone of successful hibernation. The determining factors at high elevations are temperature, precipitation, and exposure.

In the ponderosa pine forest zone during winters followed by mild, dry springs the largest percentage of beetles survived in cages on a northern exposure, whereas during winters followed by cold, wet springs survival was greatest on an eastern exposure. Winter temperature was found to be an important limiting factor in the distribution of the Mexican bean beetle. Precipitation is a major factor in successful hibernation. As the temperature decreases, so does the moisture requirement or toleration of the insect. Rain is not so detrimental as snow in the spring, especially if the snow is wet and heavy.

The parasitic fungus *Beauveria globulifera* is capable of causing a high death rate among overwintering beetles. The optimum conditions for growth and reproduction of this fungus follow heavy snowfalls or damp, rainy weather in the spring when the mean temperature is between 42° and 45° F.

Very few beetles are killed during complete dormancy; the period of heavy mortality occurs when the beetles become semiactive.

On the biology of two large lady-birds in Japan, K. IWATA (*Kansai Ent. Soc. Trans.*, No. 3 (1932), pp. 13-26, pl. 1).—This is a report of observations of the coccinellids *Aiolocaria mirabilis* Motsch. and *Pseudosynonymcha japonica* Kurisaki in Japan.

The enemies of the elm bark beetle (*Scolytus destructor* Oliv.), W. B. R. LAIDLAW (*Scot. Forestry Jour.*, 46 (1932), pt. 2, pp. 117-129, figs. 6).—This is a summary of information on the natural enemies of *S. destructor*.

Studies on the morphology and ecology of the rice leaf-beetle, *Lema oryzae* Kuwayama, with special reference to the taxonomic aspects, S. KUWAYAMA (*Jour. Faculty Agr., Hokkaido Imp. Univ.*, 33 (1932), No. 1, pp. 132, pls. 4, figs. 21; also in *Hokkaido Agr. Expt. Sta. Rpt.* 29 (1932), pp. 132, pls. 4, figs. 21).—The author's study of the morphology, ecological characters, taxonomy, distribution, and natural enemies of and control measures for *L. oryzae* here reported is accompanied by a bibliography of 122 titles.

A practical method of controlling *Dendroctonus valens* Lec., E. WALTHER (*Pan-Pacific Ent.*, 9 (1933), No. 1, p. 47).—The author reports upon an outbreak of the red turpentine beetle in Golden Gate Park in San Francisco, Calif., that was brought into practically complete control by the usual measures of sanitation and injection of ethylene chloride into the beetle burrows. The vapors of this chemical are highly toxic to all stages of the beetle, being equal to carbon disulfide in this respect. An experience, now extending well over 2 years, shows that the demonstrated efficiency of this method is over 95 percent, that absolutely no injury to the pines results from the treatments proper, and that this particular beetle epidemic has been completely checked, almost in its inception.

Contributions to the knowledge of the interrelations of bark beetles and fungi [trans. title], H. GROSMANN (*Ztschr. Wiss. Biol., Abt. F, Ztschr. Parasitenk.*, 3 (1930), No. 1, pp. 56-102, figs. 19).—A report of studies of the role of bark-breeding Ipidæ in the propagation of wood-staining and other fungi, presented in connection with a list of 62 references to the literature.

Parafoulbrood, R. E. FOSTER and C. E. BURNSIDE (*Gleanings Bee Cult.*, 61 (1933), No. 2, pp. 86-89, fig. 1).—The authors report that parafoulbrood, a disease of the brood of honeybees, has been found to occur in Florida, Georgia, South Carolina, and North Carolina. The name *Bacillus para-alvei* is given, because of its similarity to *B. alvei*, to the organism which is constantly present and has been isolated. "Some of the symptoms of this disease resemble those encountered in American foulbrood and others those found in European foulbrood. Parafoulbrood is extremely infectious, apparently being readily transmitted by robbing, drifting, and by the exchange of brood or honey from infected colonies. Methods used in the control of European foulbrood are recommended for the time being for the control of parafoulbrood."

The jungle bees and wasps of Barro Colorado Island, with notes on other insects, P. RAU (*Kirkwood, Mo.: Author*, 1933, pp. [8]+324, pl. 1, figs. [120]).—This work is based upon observations made in August and September 1928 at the jungle laboratory maintained by the Institute for Research in Tropical America under the auspices of the National Research Council on the largest island in Gatún Lake, Canal Zone, Panama.

Descriptions of new ichneumon-flies, with taxonomic notes, R. A. CUSHMAN (*U.S. Natl. Mus. Proc.*, 82 (1933), Art. 14, pp. 16).—In this contribution the author erects a new genus (*Alophosternum*), describes 9 new species and a new variety of Ichneumonidae, and presents notes on 10 other species, 1 of which is assigned a new name. Most of the species were reared from insects of economic importance, all but 2 being from North America, these being species that have been reared during a study of the parasites of the introduced birch leaf-mining sawfly *Phyllotoma nemorata* (Fall.).

Description of a chalcid parasite of the coffee borer in Indochina [trans. title], C. FERRIÈRE (*Bul. Soc. Ent. France*, 38 (1933), No. 1, pp. 9–12, figs. 2).—Under the name *Eurytoma xylotrechi* the author describes a new species of importance as an enemy of the coffee borer *Xylotrechus quadripes* Chevr.

Native parasites as a control for the oriental fruit moth, J. M. MERRITT (*Michigan Sta. Quart. Bul.*, 15 (1933), No. 4, pp. 224, 225).—It is pointed out that of the 21 species of parasites recorded as attacking the oriental fruit moth in Michigan during the past 3 seasons only 2 have adapted themselves to the short life cycle of the oriental fruit moth and been responsible for more than 1 percent parasitism. The species *Glypta rufiscutellaris* Cress. and *Cremastus minor* Cushman have, however, been reared in considerable numbers from larvae and are considered worthy of further investigation.

Twenty-five percent of all the larvae of the oriental fruit moth collected during the past 3 seasons were parasitized by *G. rufiscutellaris*, the resulting reduction in the fruit infestation having been about 40 percent, due to its parasitism of the second and third broods. Parasitism by *C. minor* in 1931 was 7 percent of all the larvae collected. Appearing at the beginning of the second generation of the moth, when the larvae were numerous, 44 percent of the larvae of that generation collected were parasitized. These native parasites were responsible for 30 percent parasitism of the oriental fruit moth during the past 3 years, with a decrease in fruit infestation somewhat more than that figure indicates. The parasite *Macrocentrus ancyliivorus* has recently been introduced into the State.

Dusting for the control of apple sawfly.—A preliminary experiment, H. W. MILES (*Jour. Min. Agr. [Gt. Brit.]*, 39 (1933), No. 12, pp. 1125–1128, pls. 4).—The author's preliminary work indicates that an attack of *Hoplocampa testudinea* Klug. upon the young fruit can be reduced by the application of a naphthalene dust at time of blossoming. In the tests the dust appeared to reduce attack and at the same time did not interfere with the set of the fruit.

The tenthredinid Neodiprion vallicola Roh., an enemy of pines in the State of Michoacán, Mexico [trans. title], I. H. OLMEDO (*Rev. Ent.*, 2 (1932), No. 2, pp. 168–175, figs. 17).—The sawfly here considered is an enemy of *Pinus ayacahuite* and *P. leiophylla* in the State of Michoacán.

Five new sawflies of the genus Neodiprion Rohwer, W. MIDDLETON (*Canad. Ent.*, 65 (1933), No. 4, pp. 77–84).—Of the five sawflies here described as new, all of which are known to defoliate coniferous evergreens in forested areas in Canada, *N. (Neodiprion) tsugae* was reared on the western hemlock in British Columbia and Alaska, and *N. (N.) rugifrons*, *N. (N.) nigroscutum*, *N. (N.) ferrugineum*, and *N. (N.) ontarioensis* on jack pine in Ontario.

The blackberry mite and its control (Eriophyes essigi Hassan), A. J. HANSON (*Washington Col. Sta. Bul.* 279 (1933), pp. 20, pl. 1, figs. 6).—The blackberry mite *E. essigi*, which was responsible in 1931 for the failure of approximately 65 percent of the berries to ripen at the Western Washington Station, is reported upon, including its occurrence in the State, where it was first observed in September 1930, the nature and extent of its injury, distribution in North

America, description, life history, natural enemy, and control measures. Its introduction into the State is thought to have been through the movement of berry crates from an Oregon cannery. Its life history in Washington has been found to vary somewhat from that in California and England, migration from the hibernation quarters being from the scales of old winter cane bud to the lateral buds, then to the fruit, instead of from the bud to the open flower.

In mite-infested fields, the early berries will often ripen before the mites become established in the fruit. In 1931 the estimated harvested unaffected fruit of the total crop was 35 percent. In 1932 the check plats showed 35.93 percent harvested normal berries. The injury caused by the mite is through its feeding at the core and at the base of the drupelets, causing the berry to remain red instead of ripening normally.

The predacious mite *Seius pomi* Parr. is responsible for destroying many blackberry mites but does not control the pest. As soon as the berry harvest is completed, old canes should be removed and burned. This practice will destroy many mites before they reach the new cane buds. In October after the old canes are removed apply lime-sulfur, 5:100, to the new canes on the lower trellis wire. Follow this with lime-sulfur, 1:40, in a period from May 10 to May 20. If the spring program is preferred, spray with lime-sulfur, 6:100, in the period from March 15 to April 1. Follow this with a lime-sulfur spray, 1:40, in the period from May 10 to May 20. No sulfur sprays should be applied after May 20 if the fruit is to be used for canning.

Accounts of the pest by Essig (E.S.R., 54, p. 559) and Hassan (E.S.R., 59, p. 563) in California and by Mote in Oregon (E.S.R., 67, p. 425) have been noted.

ANIMAL PRODUCTION

[Livestock experiments in Nebraska] (*Nebraska Sta. Rpt.* [1932], pp. 21-25, 31-33, 38, 39, 41, 42, 43).—Under cattle studies are reported data on wintering rations for stock calves; wheat v. corn for finishing yearling heifers; corn, wheat, and rye for fattening calves; creep feeding calves; the use of alfalfa pasture for fattening cattle; various grain mixtures of corn, wheat, barley, and dry pulp for fattening beef calves; and various supplements to prairie hay in wintering calves to be grazed the following summer.

The swine tests include information on forage crops for hogs; dairy by-products as hog feed; the utilization of wheat and rye as hog feed; supplementary mixtures for dry-lot hog feeding; effect of various rations on the firmness of pork; and a comparison of corn and rye for hogs.

The tests with sheep include data on the factors affecting the quality and palatability of lamb; feeding wheat to lambs; production of market lambs from aged western ewes; the value of protein supplements in lamb feeding rations; market lambs from late-bred ewes; corn, wheat, and rye for fattening lambs; and various combinations of corn, beet pulp, barley, beet tops, and cottonseed meal for fattening lambs.

With poultry results are reported on the comparative efficiency of various proteins in poultry feeding; nutrient requirements of growing chicks; loss in weight of turkey eggs during incubation; and management studies with turkeys.

Lucerne cut at various stages of growth: An investigation as to its composition and yield, E. GRIFFITH and A. A. RAMSAY (*Agr. Gaz. N. S. Wales*, 43 (1932), No. 9, pp. 657-667, figs. 3).—Chemical analyses and yield data were obtained on alfalfa grown at the Trangie and Cowra experiment farms and cut at the following stages of growth: (1) When about 6 in. high, (2) in the bud stage, and (3) in full flower.

The protein content was 26, 25.7, and 19.4 percent; the fiber content 13.9, 14.8, and 19.6; and the ash content 14.8, 13.8, and 12.4 percent at the respective stages of growth. The nutritive ratios of the alfalfa at the respective stages of growth were 1:1.8, 1:1.9, and 1:2.6.

Alfalfa cut when 6 in. high produced 3,043.3 lb. of dry matter per acre; at the bud stage, 4,164.7; and at full flower, 4,878.2 lb. About 36 percent more stock could be fed on alfalfa cut in the bud stage than if cut when 6 in. high, and when cut at the full flower stage the alfalfa would feed 60 percent more stock than when cut at 6 in. high.

A chemical study of ensiling soybeans, W. M. NEAL and R. B. BECKER (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 7, pp. 669-673).—During each of three consecutive years at the Florida Experiment Station a silo 10 ft. in diameter by 20 ft. 10 in. in height was filled with soybeans cut in the early-bloom stage, giving approximately 15 ft. of settled silage. As the silo was being filled large samples were taken, and 1 kg of each was oven dried for chemical analysis. Muslin bags containing 10 kg were returned at five different levels in the center of the silo. As the silage was removed the contents of each bag was weighed and 1 kg used for analysis.

A comparison of the fresh and ensiled material showed a loss in dry matter amounting to 9 percent, largely from the protein and nitrogen-free extract. The loss in nitrogen-free extract amounted to 17 percent and in crude protein to 34 percent. The loss in protein was greater at the bottom of the silo than at the top, due probably to continued fermentation for a longer time. There was little apparent change in the crude fiber. The ether extract increased 20 percent as a result of the formation of additional ether-soluble substances.

Gravitational movement of water and, to a lesser extent, of organic matter was observed. The gravitational movement of mineral matter was slight. On the whole, the changes in composition were comparable to those found by other workers with ensiled corn plants and grasses.

Accessory food factors: The fat-soluble vitamin requirements of cattle and pigs during growth, with remarks on some other questions as to the vitamin problem in cattle and pig feeding, H. ISAACHSEN (*Jour. Agr. Sci. [England]*, 22 (1932), No. 3, pp. 460-484, figs. 3).—A series of experiments was carried out at the Institute of Animal Nutrition, Royal Agricultural College of Norway, on the vitamin requirements of calves, young cattle, and growing pigs.

Calves fed for 7 weeks or 6 months on a limited amount of whole milk and large quantities of separated milk, to which was added arachis oil free from fat-soluble vitamins, grew as well as calves on liberal amounts of whole milk and limited amounts of separated milk. Calves fed a limited amount of whole milk and liberal amounts of separated milk, to which was added cod-liver oil for 6 months, and then fed a grain and hay ration did not grow noticeably better than calves fed a liberal amount of whole milk and a limited amount of separated milk. Calves which received separated milk, with the addition of tapioca up to from 3 to 6 months of age, grew as well as those receiving whole milk to the same age. The calves born during the spring and summer months did not develop any better than calves born during the autumn and winter months in spite of the fact that the milk was richer in vitamins A and D during the spring-summer period. Herring meal containing appreciable amounts of antirachitic vitamin appeared to maintain the calcium and phosphorus balance in milking cows on dry feed better than did fish meal with almost no vitamin content.

The results in several series of tests with pigs indicated that cereals, including yellow corn, contained sufficient fat-soluble vitamins to support normal growth. However, the vitamin D content may not be sufficient to protect against rickets. A good grade of herring meal proved to be one of the best sources of vitamin D. Repeated attempts to make unthrifty suckling pigs vigorous by administering varying amounts of cod-liver oil failed. The addition of wheat bran with germs or yeast did not improve the general health of pigs whose dams were poor milkers. Irradiating sows with ultra-violet light did not improve the growth or well-being of the pigs. There was no difference in the rate of growth or any appreciable difference in the date of appearance of rickets in pigs fed an unbalanced diet and kept in pens with ultraviolet transmissible glass and those kept behind ordinary window glass.

The effects of management and sex on carcasses of yearling cattle, M. T. FOSTER and J. C. MILLER (*Missouri Sta. Res. Bul.* 186 (1933), pp. 20 figs. 4).—Physical and chemical analyses as well as cooking and palatability tests were made on the carcasses of the yearling steers and heifers used in a previous study (E.S.R., 68, p. 76).

The more liberal rations generally produced proportionate increases in slaughter and carcass grades, dressing percentage, fat content, cooking losses, and palatability. There were proportionate decreases in lean, bone, moisture content, and shrinkage from chilling. Although the dressing percentage of steers was somewhat higher than that of comparable heifers, there was less fat and more lean and bone in the steer carcasses. The roasts from steer carcasses lost more in cooking than roasts from heifer carcasses. The palatability of roasts was not influenced by sex. The major portion of the heifer carcass was in hind quarters, but the opposite was true of the steer carcass. Fat yearling heifers when marketed at an early age produced beef equal to that produced by comparable steers.

The effect of lime and cod-liver oil on sheep fed on a calcium deficient ration, D. W. AUCHINACHIE and A. H. H. FRASER (*Jour. Agr. Sci. [England]*, 22 (1932), No. 3, pp. 560–575, figs. 2).—At the Rowett Research Institute, Scotland, four lots of five wethers, weighing an average of 89.3 lb. each, were confined in inside feeding pens, and four similar lots were kept in outside enclosures. A basal ration made up of equal parts of corn, bran, dried grains, and oats fed at the rate of 1.5 lb. per head daily, 8 lb. of sliced yellow turnips, and 0.5 lb. of oat straw was fed in each lot. In addition the respective lots in each group received the following supplements: None, lime, cod-liver oil, and lime and cod-liver oil.

From November to June the unsupplemented group kept indoors gained an average of only 8.3 lb., while those kept outdoors gained 31.4 lb. Adding cod-liver oil to the basal ration of the inside group permitted them to gain 32.6 lb. during this time. The basal ration produced a fall in serum calcium in both groups, and the outdoor group made their maximum gains in weight at the time when the serum calcium had fallen to a 7.05 mg percent level. These results indicated that a low serum calcium level was not incompatible with rapid growth, and that the stunting of the inside basal group was not due to the calcium deficiency of the ration. Adding lime to the basal diet indoors prevented "bent leg", anorexia, complete collapse of health, and low serum calcium level, but had no influence on rate of growth. Since both cod-liver oil and outdoor conditions accelerated growth over the indoor basal group, it seemed probable that the basal ration was deficient in vitamin D.

Under outdoor conditions there was apparently a reciprocal relationship between the levels of serum calcium and blood phosphorus, the calcium rising

as the phosphorus fell and vice versa. Under indoor conditions the reciprocal rise in phosphorus did not occur, but cod-liver oil raised both the serum calcium and blood phosphorus. It was evident that under the conditions of the indoor basal group there was an insufficient utilization of the phosphorus in the diet.

The results of the study show that in order to obtain normal calcium metabolism an adequate supply of lime in the ration and a factor necessary for utilizing the lime are required. In this study the latter factor was supplied by cod-liver oil and summer sunlight, but was not sufficiently supplied by winter sunlight.

Fifth year's results of crossbreeding studies in the production of California spring lambs, R. F. MILLER (*Natl. Wool Grower*, 22 (1932), No. 6, pp. 15, 16, figs. 4).—Continuing this study at the California Experiment Station (E.S.R., 67, p. 158), the final weight per lamb ranked as follows according to the breed of their sires: Hampshire, Suffolk, Southdown, and Shropshire. In grading the lambs on foot they ranked: Southdown, Suffolk, Hampshire, and Shropshire, while in grade of carcass the Southdown and Shropshire led the Suffolk and Hampshire. The Shropshire lambs led all other lots in dressing percentage. In value per pound the carcasses ranked as follows: Southdown, Shropshire, Hampshire, and Suffolk, but in value per carcass they ranked: Hampshire, Southdown, Shropshire, and Suffolk.

Corn preparation with alfalfa and silage for fattening lambs, J. M. EVVARD, P. S. SHEARER, C. C. CULBERTSON, and Q. W. WALLACE (*Iowa Sta. Bul.* 299 (1933), pp. 297-320, figs. 2).—A series of two experiments were undertaken to obtain information as to the most practical method of feeding corn to fattening lambs. The value of corn silage as the sole roughage or as part of the roughage was also studied.

When any single preparation of corn was fed throughout the feeding period, it did not appreciably affect the gain of the lambs being fattened. When lambs were fed ground shelled corn with alfalfa hay as the sole roughage they gained slightly faster than lambs fed shelled corn or broken ear corn, but when the roughage was corn silage the lambs fed ground shelled corn made the least gains. With alfalfa hay and corn silage as the roughage, ground shelled corn produced less gain than whole ear, broken ear, or shelled corn. Corn-and-cob meal produced good gains. In one test the lambs that made the largest gains were started on whole ear corn, changed to broken ear corn, and finished on ground shelled corn. The preparation of the corn did not stimulate the daily grain consumption. In general the lambs fed the more highly prepared forms of corn required less grain per unit of gain, but the lambs started on whole ear, changed to broken ear, and finished on ground shelled corn required the least feed per unit of gain.

Corn silage as the sole roughage was unsatisfactory for fattening lambs. A combination of corn silage and alfalfa hay as measured by gains, feed requirements, and finish of lambs gave good results. On the basis of margin per lamb over feed cost, broken ear corn and shelled corn in one test and broken ear corn and the combination of whole ear, broken ear, and ground shelled corn gave the best results. It was concluded that the preparation of corn requiring the least expense would show the best results in the average Corn Belt feed lot.

Loss in weight of wools held on ranch, J. I. HARDY (*Natl. Wool Grower*, 22 (1932), No. 6, pp. 28, 29).—A record was maintained over a period of 4 years at the U.S. Sheep Experiment Station, Dubois, Idaho, to determine variations in the moisture of wool clips. During storage at the ranch the loss in weight of wool varied from about 1.4 to about 3.5 percent. The percentage moisture

change from loading to the Boston market varied from a gain of about 1.1 to a loss of about 1.8 percent. The loss from shearing to Boston varied from 1.1 to 5.3 percent, and the greatest portion of this loss occurred during storage at the ranch.

The determination of the surface area of swine and other animals, T. DEIGHTON (*Jour. Agr. Sci. [England]*, 22 (1932), No. 2, pp. 418-449, pls. 2, figs. 3).—While studying the metabolism of pigs by calorimetric methods at the Institute of Animal Nutrition, Cambridge University, it was found that the various formulas which had been proposed for computing the surface area of these animals gave widely divergent results. It is concluded that the actual estimation of the area was the only satisfactory method where an accuracy greater than ± 10 percent was desired.

In studying this problem it was found that surface area was to some extent variable in individual animals, and that direct determinations from this viewpoint are less satisfactory than might be thought. A new method is proposed for estimating the surface area of a pig in a definite standing position, depending on mathematical and photographic conditions only. This method is applicable to the living animal and to the same animal at different times during its life. A mathematical investigation of the errors involved and the way in which they combined in the final results seemed to justify a claim to the accuracy of this method within about ± 2 percent. Possible application of this method to other animals is outlined.

The value of tapioca flour and sago pith meal in the nutrition of swine, H. E. WOODMAN, A. W. M. KITCHIN, and R. E. EVANS (*Jour. Agr. Sci. [England]*, 21 (1931), No. 3, pp. 526-546).—An investigation was carried out at the Institute of Animal Nutrition, Cambridge University, to secure data on the digestibility of tapioca flour and sago pith meal for pigs. Two Large White pigs weighing 195 and 188 lb., respectively, were used for the digestion trials. In the first test the digestibility of a ration made up of fish meal, middlings, maize meal, and sago pith meal was determined, and this was followed by a digestion period on the same ration with sago pith meal omitted. In a third period tapioca flour replaced a like amount of sago pith meal fed during the first period.

Three separate feeding tests were carried out in connection with the above work to test the feeding value of tapioca flour and sago pith meal for bacon hogs. The first test was a direct comparison of the two feeds for pigs fed from 80 lb. live weight to slaughter, while in the second test sago pith meal was fed to pigs from 100 lb. live weight to slaughter. The third test was a repetition of the second except that the sago pith meal was limited to 20 percent of the ration, while in the previous test 40 percent of the meal was added during the last half of the test. A third lot of pigs was included in the last trial to test the efficiency of sago pith meal plus a small allowance of bran as a substitute for middlings.

Tapioca flour proved to be one of the most digestible feeding stuffs employed in swine husbandry. The results of the digestion trial confirmed the findings of earlier workers that tapioca flour is capable of replacing barley or maize in the ration of pigs. The pigs in the feeding tests received 3 lb. of tapioca flour per head daily for 3 weeks prior to slaughtering. The tapioca flour exerted a distinctly favorable effect on the color and texture of the carcass fat and on the quality of the bacon.

Sago pith meal could be used as a substitute for 20 percent of the barley meal without affecting the rate of gain. It was more suitable for pigs of 100 lb. live weight than for smaller pigs. At a 40 percent level the sago pith

meal was distinctly less valuable than barley meal because of the depressing effect exerted on the other constituents of the ration, particularly the protein, since this feed contains no digestible protein. With a small allowance of bran, sago pith meal was an efficient substitute for middlings. This meal also exerted a favorable influence on the quality and conformation of the animals fed.

The value of degermed maize meal (cooked) in the nutrition of swine, H. E. WOODMAN and R. E. EVANS (*Jour. Agr. Sci. [England]*, 22 (1932), No. 3, pp. 670-675).—In studies at the Institute of Animal Nutrition, Cambridge University, England, it was found that degermed corn meal (cooked) was equal in digestibility to such feeds as tapioca flour and flaked corn and was significantly superior to whole corn meal and barley meal. On the basis of its digestible nutrient content, 1 lb. of degermed corn meal could replace in the ration of growing pigs 1 lb. of tapioca flour or flaked corn, 1.1 lb. of whole corn meal, or 1.2 lb. of barley meal. Because of its low oil content this feed could be used in the ration of fattening pigs up to the date of slaughter, an advantage not possessed by either whole corn meal or flaked corn.

The value of oats in the nutrition of swine, H. E. WOODMAN, R. E. EVANS, and A. W. M. KITCHIN (*Jour. Agr. Sci. [England]*, 22 (1932), No. 3, pp. 657-669).—Digestion trials with pigs at the Institute of Animal Nutrition, Cambridge University, England, showed marked differences in the extent to which pigs were able to digest oats, ground to varying degrees of fineness. The digestion coefficient of the organic matter in crushed oats was 56.7 percent; in farm-ground oats, 67.5 percent; and in Sussex-ground oats, 75.9 percent. On the basis of 100 lb. of dry matter consumed, pigs were able to digest 72.7 lb. of organic matter from Sussex-ground oats, 65.4 lb. from farm-ground oats, and 55.2 lb. from crushed oats.

Even in the finely ground state oats were somewhat inferior, from the standpoint of digestibility, to barley meal for pigs. On the basis of digestible organic matter 1.1 lb. of Sussex-ground oats, 1.2 lb. of farm-ground oats, and 1.5 lb. of crushed oats will be needed to replace 1 lb. of barley meal. In the two separate feeding tests neither the partial nor total replacement of barley meal with farm-ground oats exerted any significant effect on the rate or economy of gain.

The oil from oats brought about no detrimental effect on carcass quality.

Dried sugar-beet pulp for pigs, T. S. WRIGHT (*Jour. Min. Agr. [Gt. Brit.]*, 39 (1932), No. 2, pp. 111-115).—At the Harper Adams Agricultural College, England, pigs weighing approximately 54 lb. per head were divided into 3 lots of 10 pigs each and were fed for 4 months. The basal ration fed in lot 3 was made up of barley meal, tapioca meal, soybean meal, and minerals. To this basal ration was added in lot 1 middlings and in lot 2 beet pulp.

There was no significant difference in the rate of gain in any of the lots. The feed cost per unit of gain was cheapest in lot 2 and highest in lot 3. Samples of back fat taken at the time the pigs were slaughtered showed that the fats in all lots were firm. There was no appreciable difference in the quality of the bacon from the different lots. It was concluded that "plain" dried sugar beet pulp, when supplemented by a protein feed, was an efficient substitute for middlings for fattening hogs, but should not form more than 20 percent of the ration because of its laxative effects. Beet pulp should be fed three times daily and should be used with care for pigs under 16 weeks of age.

Feeding spring pigs on pasture, V. A. FREEMAN (*Michigan Sta. Quart. Bul.*, 15 (1933), No. 4, pp. 275-277, fig. 1).—Over a 4-year period the value of feeding protein supplements to 50-lb. pigs on rape pasture was tested with corn, barley, or wheat, alone or in combination with oats. On the average 100 lb. of tankage

saved 452 lb. of grain, but in the case of barley 100 lb. of tankage saved only 345 lb. of grain. Tankage shortened the feeding period 9 days with barley, 19 days with wheat, and 18 days with corn. It is pointed out that early spring pigs should be liberally fed on grain and protein supplements in order that they will be ready for the high markets of August and September.

Wiltshire sides: Factors which influence production and quality, J. H. SHEPPERD and A. SEVERSON (*North Dakota Sta. Bul.* 263 (1933), pp. 43, figs. 18).—Concluding this series of studies (E.S.R., 63, p. 860), it was found that hogs of Wiltshire type could be produced in North Dakota using farm-grown grains for the major portion of the feed mixtures. Hogs of lard type and lard-bacon crossbreds had no difficulty in competing with hogs of bacon type for such sides when marketed within proper weight limits and moderately finished. No extra advantage was noted in crossing lard and bacon breeds for production of Wiltshire sides.

As a supplement for pigs on alfalfa pasture, a mixture of barley, shorts, tankage, linseed meal, and minerals gave excellent results. Hogging down Canadian field peas supplemented with carbonaceous grains produced economical gains and desirable carcasses. Hogging down early maturing corn supplemented with Canadian peas or other protein feed proved to be an ideal combination for the finishing period. It was recommended that green corn be hogged down after the kernels had reached the hard dough stage. Pigs that had hogged down corn shrank less in shipping than those finished in dry lot.

No one breed of hogs had a distinct advantage over the other breeds in these tests. Yorkshires had a higher shrink than Chester Whites, Duroc Jerseys, and Chester-Yorkshire crossbreds. Yorkshire and Chester-Yorkshire crossbreds had a slightly higher dressing percentage than Chester Whites and Duroc Jerseys. Chester Whites and Durocs took on a heavier fill at market than Yorkshires and Chester-Yorkshire crossbreds. The Yorkshires in this test had a slight advantage over the other breeds in percentage of Wiltshire sides.

Small skin blemishes or bruises disqualified carcasses for Wiltshire sides. Carcasses suitable for such sides also produced desirable domestic cuts of pork. Swirls were no indication of lack of quality in carcasses. Tattooing prior to marketing made positive the identification of carcasses. American Wiltshire belly and loin strips were judged inferior in taste to Danish, Irish, and Swedish samples.

Wintering draft colts, R. S. HUDSON (*Michigan Sta. Quart. Bul.*, 15 (1933), No. 4, pp. 277-282, figs. 2).—Yearling and 2-year-old draft colts were divided into two groups of 9 head each and fed from November 15 to March 1. One group was fed shock corn that had been cut before frost and shocked while still green. The other lot received the same corn after it had been run through a cutting box. The same amount of fodder and hay was fed in both groups.

During the first 45 days, when large amounts of hay were fed, the colts in lot 1 gained 0.6 lb. per day and those in lot 2, 1.8 lb. per day. After this period the amount of hay was materially reduced, and the gains for the remainder of the test were -0.3 and -0.1 lb. per head daily in the respective lots. The cost of labor and feed per colt per day was 12 c. in lot 1 and 15 c. in lot 2.

From March 1 to April 9 the two lots were fed in the barn. Lot 1 received a ration of 1 lb. of a mixture of ear corn and oats 2:1 per 100 lb. live weight, 1 lb. of oil meal, second-cutting alfalfa morning and noon, and mixed timothy hay at night. The hay was also fed at the rate of 1 lb. per 100 lb. of live weight. Lot 2 received the same ration, except that the grain mixture was

ground. During this period the gains in the respective lots were 2.1 and 2.6 lb. per head daily.

It was concluded that shocked corn fed in the field during stormy weather would maintain the weight of horses, but if gains in weight were desired some grain or hay should be used as a supplement. There was no particular advantage in chopping shock corn for feeding the draft colts. Ground grains produced greater gains than whole grains when feeding colts for spring work.

The culling of poultry, H. MOLYNEUX ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul.* 59 (1932), pp. V+28, pls. 8, figs. 8).—The economic importance of culling, culling practices, factors on which culling is based, and time of the year to cull poultry are discussed in this bulletin.

Mixed protein rations for laying hens and breeders (Single Comb White Leghorns), R. T. PARKHURST and I. W. RHYS (*Harper Adams Agr. Col. Bul.* 7 (1932), pp. 20, figs. 4).—The object of this study was to determine the most economical ration for the production of eggs. Comparisons were made between fish meal and meat-and-bone meal, decorticated peanut meal and extracted soybean meal, and dried skim milk and dried buttermilk when used in a mixed protein ration. A comparison was also made between a mixed protein ration and a ration in which meat-and-bone meal furnished all the protein. The experiment was divided into the following parts: (1) During the pullet year, (2) during the second year of production, and (3) after the second year's production.

The results under the conditions of this test showed that there was no material advantage in using fish meal instead of meat-and-bone meal, dried buttermilk instead of dried skim milk, or peanut meal instead of soybean meal during the pullet year. In this year the best egg production and margin over feed cost was obtained through the use of a combination of meat-and-bone meal, dried skim milk, and soybean meal. The results in the second year were essentially the same as in the pullet year. Hatchability was not materially affected by the various rations and was satisfactory in all pens. For birds over 2 years it was found that a mixed protein ration gave better results than a simple protein ration in production, economic returns, fertility, and hatchability.

Protein levels in battery brooding chicks, A. E. TEPPER, T. B. CHARLES, and F. D. REED (*New Hampshire Sta. Circ.* 40 (1933), pp. 7).—In an effort to measure the protein requirements of growing chicks when brooded in battery brooders three tests were conducted, using six lots of 50, 60, and 50 chicks each which were fed on a ration in which the amounts of corn meal, meat scrap, fish meal, and dried skim milk were varied to produce rations containing from 15 to 20 percent of protein. The chicks were kept in heated-room type batteries. A fourth test was conducted in which the pullets from the 16, 18, and 20 percent protein groups were placed in separate laying pens and continued on the same ration they received during the brooding period except that oyster shell and grit were added. Records were kept for these groups on feed consumption, weight of birds, egg production, egg weight, and mortality.

Under the conditions of this test it was found that with one exception each additional increase in protein level gave definite increases in weight gains and efficiency of consumption. The 20 percent level group was the most efficient, suggesting the possibility that even higher levels might be advisable. The rations having protein levels of less than 17 percent were not desirable in this test. That the higher protein levels may hasten sexual maturity was indicated when measured by percentage production one month after the first egg was laid. The efficiency of feed consumption based on weight gains decreased with advancing age. The birds on the low level matured more slowly, both

physically and sexually, than those on the higher levels. The higher protein groups laid larger eggs during the first part of the experimental period, but after four months' production there was no significant difference between the groups.

Batteries for chickens, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul.*, 18 (1933), No. 162, pp. 63-70, fig. 1).—Preliminary results of tests with laying batteries have shown no serious obstacles or handicaps so far as the performance and behavior of the birds are concerned when compared with similar birds in laying houses. Laying batteries offer many advantages for trap nesting or for proving prospective breeders as pullets. While the batteries did not seem to lessen mortality due to leucosis and fowl typhoid-like diseases, the number of cases of range paralysis was materially reduced. No colds, roup, or respiratory troubles were experienced among 600 caged layers during a 2-year period. Batteries are also extensively used for finishing market broilers after 6 weeks of age.

Mineral balance studies on poultry, R. H. COMMON (*Jour. Agr. Sci. [England]*, 22 (1932), No. 3, pp. 576-594).—Experiments by the Ministry of Agriculture for Northern Ireland and Queen's University of Belfast were begun in an attempt to secure information on the changes in calcium and phosphorus metabolism which accompany the onset of egg production.

The results of two studies on calcium and phosphorus balances on laying pullets showed that the birds displayed a diminution of calcium and phosphorus in their droppings over a period of from about 2 to 3 weeks before laying and a correspondingly increased retention of these elements. Egg laying was correlated with a relatively heavy voiding of phosphorus in the droppings, involving a temporary negative phosphorus balance. The nature and meaning of the phenomenon are discussed.

The relation of calcium and phosphorus to growth and rachitic leg weakness in chickens, R. T. PARKHURST and M. R. McMURRAY (*Jour. Agr. Sci. [England]*, 22 (1932), No. 4, pp. 874-882).—A study was undertaken at the National Institute of Poultry Husbandry, England, to compare a ration with a high calcium-phosphorus ratio with a ration having a low calcium-phosphorus ratio.

Retarded growth and poor bone development resulted from feeding both a ration containing 0.26 percent of calcium and with a calcium-phosphorus ratio of 0.44:1 and from a ration with a 3 percent calcium content, most of which was derived from ground limestone, and a calcium-phosphorus ratio of 4:1. The results with the basal group confirmed other reports indicating that ground limestone has a depressing effect on growth.

The effect of inadequate rations on the production and hatchability of eggs, L. F. PAYNE and J. S. HUGHES (*Kansas Sta. Tech. Bul.* 34 (1933), pp. 64, figs. 19).—A series of 11 experiments was carried out to determine the value of vitamins A, B, C, and D in the ration of laying hens. Their value was measured by the number of eggs produced, fertility and hatchability of eggs, mortality and general health of birds, and gain or loss in body weight during the period of the experiment.

When rations were deficient in vitamins A, B, or D, the egg production and hatchability of breeding flocks were reduced. Vitamin C was not essential in poultry rations. Alfalfa leaf meal was found to be an excellent source of vitamin A, and in a ration otherwise deficient in this vitamin 10 percent of the meal was adequate. When 65 percent of the ration was made up of yellow corn, 5 percent of the total feed intake in the form of alfalfa leaf meal furnished sufficient vitamin A, but when 65 percent of the ration consisted

of white corn 10 percent of the meal was needed. Rations prepared from the common grains contained adequate amounts of vitamin B. Under the climatic conditions of Kansas there was enough sunshine to meet the vitamin D requirements when birds were housed and managed so that they received the direct rays of the sun.

Ordinary window glass screened out practically all the ultraviolet rays of sunlight. Ultraviolet light from suitable lamps was effective for meeting the vitamin D requirements of poultry, and cod-liver oil was also an adequate source of this vitamin. Irradiated feeds in these studies did not prove to be satisfactory sources of vitamin D.

The pH of fresh and storage eggs, S. E. ERIKSON, R. E. BOYDEN, J. H. MARTIN, and W. M. INSKO, JR. (*Kentucky Sta. Bul.* 335 (1932), pp. 357-394, figs. 3).—White Leghorn pullets of approximately the same size, age, and sexual maturity were divided into 6 pens of 25 birds each and were fed the same basal ration. Two pens were confined to a house with sunlight filtered through ordinary window glass, two pens to a house with a sun porch, and two pens were allowed range in a bluegrass yard. One pen of each pair received the basal ration only, while the other pen had 2 percent of cod-liver oil added to the mash. Eggs for chemical examination were collected from 6 birds in each pen on every other 10-day period from February 19 to May 29. To study the effect of storage, eggs were collected from May 29 to June 30 and were placed in cold rooms at temperatures varying from 30° to 38° F. for a period of approximately 1 year.

The results of the study are divided into two parts, the first of which is a description of the procedure for determining hydrogen-ion concentration of eggs. In this phase it was found that the quinhydrone and the Bailey hydrogen electrodes checked each other up to a pH of 9.0 to within 0.1 of a unit. The pH of opened whites was not affected by 30 minutes' exposure or the yolks by 80 minutes' exposure. Diluting the yolk and white 1:1 did not seem to affect the pH whether the dilution was made before or after being allowed to stand. There was no difference in the pH of the thick and thin portion of the white. It was concluded that in such determinations the yolks and white could safely be diluted, and that the pH should be determined within 30 minutes after opening. Since the quinhydrone electrode was the quicker method, it could be used for determining the pH of fresh eggs but could not be used for the whites of storage eggs, which may run above pH 9. Further work indicated that standing unbroken up to 9 hours was not a factor affecting the averages of the pH values.

In the second phase it was shown that neither cod-liver oil, sunshine, nor bluegrass range influenced the pH value of the eggs. The greatest variation in the pH of whites of fresh eggs ranged from 7.894 to 7.95 and of yolks from 6.309 to 6.336. There was a greater variation among the stored eggs with a range of variation for whites of from pH 8.81 to 8.96 and for yolks of from 6.9 to 7.018. During storage there was a definite increase in the alkalinity of both the yolk and white of eggs.

The relation of yolk index to the interior quality by candling and from the opened egg, G. F. STEWART, A. R. GANS, and P. F. SHARP (*U.S. Egg and Poultry Mag.*, 38 (1932), No. 11, pp. 35-39, figs. 10).—This study at the New York Cornell Experiment Station was undertaken to determine the relation of yolk index (E.S.R., 63, p. 766) to other measured quality factors and to the candlers' scores of quality.

It was shown that two of four candlers appeared to score down yolk visibility as the yolk index decreased. All of the candlers scored down the

white, grade, and air-cell size with decreasing yolk quality. The extent to which the size of air cell influenced the scores of white and grade is not known, but it was clearly evident that the size did influence these scores.

The Angora rabbit, E. TÄNZER and C. SPREHN (*Das Angorakaninchen. Hannover: M. & H. Schaper, 1932, pp. 161, figs. 53*).—A general account of the Angora rabbit by Tänzer (pp. 9–125) is followed by a contribution on diseases of Angora rabbits by Sprehn (pp. 126–151). A bibliography of 7 pages and an index are included.

Studies in the composition of rabbit carcasses.—I, White Angoras, W. K. WILSON and S. MORRIS (*Jour. Agr. Sci. [England], 22 (1932), No. 3, pp. 453–459*).—A study was made at the National Institute of Poultry Husbandry and the Harper Adams Agricultural College, England, to compare the carcass composition of male and female rabbits and to make a similar comparison for young and adult rabbits.

During the dressing process the carcasses of male rabbits shrank more than those of female rabbits of similar age. There was a marked difference in the flesh of male and female rabbits. In the young group female carcasses contained approximately 4 percent and in the adult group about 6 percent more fat than male carcasses.

DAIRY FARMING—DAIRYING

[**Investigations with dairy cattle and dairy products**] (*Connecticut Storrs Sta. Bul. 181 (1932), pp. 6, 7*).—Data are reported on the maintenance of an abortion-free herd, the value of temporary and permanent pastures for milk production, the effect of mechanical grooming machines on milk yield and fat test, the value of succulence in the form of silage in the ration of dairy cows, and the cause and control of “cardboard” flavor in milk.

[**Experiments with dairy cattle and dairy products in Nebraska**] (*Nebraska Sta. Rpt. [1932], pp. 8, 9, 39, 42*).—From the work with dairy cattle results are reported on the effect of sires on the butterfat production of their daughters and the effect of nutrition on milk and butterfat production.

In dairying information is presented on the principles of ice cream making and on “fat-soluble A” as present in the milk of Holsteins, Ayrshires, Jerseys, and Guernseys.

[**Dairy cattle experiments in the Virgin Islands**], N. N. NICHOLS (*Virgin Islands Sta. Rpt. 1932, pp. 16–18*).—Information is reported on the milk and butterfat production of native and grade dairy cows; on the feeding value of sorghum, Sudan grass, elephant grass, and guinea grass for dairy cows; and on the growth of dairy calves.

1932 experiments with alfalfa as pasture for dairy cows, A. B. DORRANCE and H. C. RATHER (*Michigan Sta. Quart. Bul., 15 (1933), No. 4, pp. 243–248, fig. 1*).—Continuing this study (*E.S.R.*, 68, p. 236), the gross returns per acre in 1932 for the respective plats were \$36.49, \$30.16, \$34.20, and \$18.30. The results of the study so far show that the dairyman can regulate his grazing to suit his needs. It was also found that it was not necessary to discontinue grazing on September 1. When the third growth was pastured lightly after that date no severe winter injury to the stand was experienced if an 8-in. growth was allowed to remain.

Fish meal versus cottonseed meal as a feed for dairy cows, L. W. INGHAM (*Maryland Sta. Bul. 342 (1932), pp. 413–422*).—Using the double reserval method made up of three periods of 28 days each, preceded by 7-day preliminary periods, two groups of six cows each were fed to compare the value of fish

meal and cottonseed meal. The same basal ration was fed in both groups, the only difference being in the two protein feeds used. The percentage of digestible protein in the ration was 20.5 in both cases. Alfalfa hay and silage were also fed.

In this test fish meal was fed with satisfactory results. The feeding value of the two rations was practically the same whether compared on the basis of total milk and total butterfat or on the basis of butterfat test. No trouble was experienced in getting the cows to eat the fish meal ration, nor were any off flavors or odors detected in the milk produced when this ration was fed. It appeared that the cost of the two meals should be the deciding factor in choosing between them.

A comparison of tepary bean hay to alfalfa hay in a ration for growing dairy heifers, E. E. JACOBS ([*Oklahoma*] *Panhandle Sta., Panhandle Bul.* 50 (1933), pp. 8).—Two groups of four Holstein heifers each were fed 80 days on a ration made up of 900 lb. of either alfalfa or tepary bean meal, 100 lb. of cottonseed meal, and 1,000 lb. of ground milo heads. Lot 1, which received the alfalfa meal, gained a total of 446 lb. and lot 2 a total of 474 lb. during the test. The results indicate that tepary beans are a valuable roughage, equal in feeding value to alfalfa for growing dairy heifers. Because of the prohibitive price of alfalfa in the Panhandle section, it is recommended that teparies be used to replace alfalfa as a nitrogenous roughage for heifers.

The progeny test as a method of evaluating the dairy sire, J. EDWARDS (*Jour. Agr. Sci. [England]*, 22 (1932), No. 4, pp. 811–837, fig. 1).—In this paper from the Animal Nutrition Institute, Cambridge University, England, the author makes a survey of some environmental and physiological factors influencing milk yield and an analysis of theories of and experiments on milk and butterfat inheritance. Further evidence is presented to show that the proved dairy sire is the outstanding means of improving dairy cattle breeding. The need of prolonging the breeding life of proved sires and of evolving a scheme for the regular progeny recording of all dairy sires is also emphasized.

In order to give a reasonably accurate indication of a sire's transmitting ability, it was found that the minimum number of unselected daughters was six. The average yield of daughters was the most satisfactory indicator of a bull's transmitting ability in determining sire indexes. While such an index is of general value, it is shown that in the process of proving any given sire it is of extreme importance to make a detailed examination of all available information on every record.

A yeast extract medium for determining the bacterial content of milk by the plate method, E. D. DEVEREUX and J. L. ETCHELLS (*Amer. Jour. Pub. Health*, 23 (1933), No. 2, pp. 149–151, figs. 2; *abs. in Michigan Sta. Quart. Bul.*, 15 (1933), No. 4, p. 303).—Using the yeast extract medium previously described (E.S.R., 69, p. 103), a comparison was made of the bacterial counts obtained with it and with those obtained using the technic prescribed by the Standard Methods of Milk Analysis.

The comparison showed that the counts obtained at the end of 24 hours' incubation using the yeast extract medium were on the average comparable to those obtained with plain nutrient agar at the end of 48 hours. The method resulted in a saving of 24 hours for the completion of the test. At the end of 48 hours counts with the yeast extract medium averaged 45 percent higher than similar counts made with plain agar.

Sediment test not a reliable guide in the selection of milk for homogenization, G. M. TROUT and C. P. HALLORAN (*Michigan Sta. Quart. Bul.* 15 (1933), No. 4, pp. 271–274).—A study was made to determine whether the sedi-

ment test (E.S.R., 68, p. 522) could be used as a reliable guide in selecting milk for homogenization and to ascertain the amount and composition of the sediment. Sediment tests were made on samples of milk obtained from 30 patrons of the college creamery. The milk was then pasteurized at a pressure of 2,500 lb. Samples of the milk were cooled to 40° F. and held at that temperature for 96 hours. The samples were examined at 24-hour intervals for the presence or absence of sediment and its character.

The results showed that a sediment test previous to homogenization was not always a reliable guide in the selection of milk for homogenization. The sediment resembled clarifier slime but differed somewhat in composition.

The agar disc method for studying the contamination from metal surfaces, H. C. OLSON and B. W. HAMMER (*Iowa Sta. Bul.* 300 (1933), pp. 321-335, figs. 12).—The method previously described (E.S.R., 66, p. 169) was applied to a study of the contamination from metal utensils and equipment. Tests on milk cans, vats, coolers, bottlers, freezers, sanitary piping, etc., indicate that the agar disc was readily applicable to metal surfaces. By means of a series of illustrations the effect of different methods of cleaning such equipment on its bacterial contamination is shown.

Some effects of freezing on the physical and nutritional properties of milk, R. C. MUNKWITZ, M. H. BERRY, and W. C. BOYER (*Maryland Sta. Bul.* 344 (1933), pp. 435-446, figs. 2).—This study was undertaken to determine the effect of freezing upon the physical properties and the nutritive value of milk. One group of rats was fed only commercially pasteurized whole milk, while another group received the same milk except that it had been frozen. Both groups were fed equal amounts of the respective milks. The animals were weighed weekly and at the end of 12 weeks were killed and the femur bones removed for analyses.

The results of the effect on the physical properties showed that freezing caused a partial precipitation of the milk solids. Albumin was precipitated in greatest amounts, followed in order by lactose, total protein, ash, casein, total solids, and fat. With the exception of the fat, the amount of precipitation increased as the length of the feeding period increased. The fat globules of the frozen milk clumped and became distorted and irregular in size and shape.

The results with rats as shown by growth rates, calcification of femur bones, and physical condition did not indicate that freezing impaired the nutritive value of the milk.

A study of vitamin D in normal milk, H. E. BECHTEL and C. A. HOPPERS (*Michigan Sta. Quart. Bul.*, 15 (1933), No. 4, pp. 239, 240).—Preliminary results in studies with rats indicated that normal milk produced by cows on Sudan grass pasture in summer and receiving about 20 lb. of second-cutting, field-cured alfalfa during the winter was not as deficient in vitamin D as formerly supposed.

Vitamin D milk, W. E. KRAUSS and R. M. BETHKE (*Ohio Sta. Bimo. Bul.*, 18 (1933), No. 162, pp. 77-80).—In this article the authors discuss the methods now in use for increasing the vitamin D content of milk and point out the problems that will be met in the production of milk containing a specified amount of vitamin D.

The relation of dry skim milk to the physical and chemical properties of cottage cheese, W. H. E. REID and C. L. FLESHMAN (*Missouri Sta. Res. Bul.* 187 (1933), pp. 23).—This study was undertaken to investigate methods and conditions under which dry skim milk might be successfully used in the manufacture of cottage cheese. Spray, vacuum drum, and atmospheric drum dry skim milk powders were used, but the attempts to make cottage cheese with

atmospheric drum processed dry skim milk were unsuccessful because of the high solubility index. The studies included the influence of the different factors and combination of variable factors on the chemical and physical properties of cottage cheese.

A direct relationship was found between the acidity of the curd and whey at the time of cutting, the percentage yield, and the physical properties of the finished cheese. If the curd was not heated the acidity at the time of cutting should test between 0.7 and 0.73 percent for cheese made from reconstituted skim milk. There was a direct relation between the specific gravity, acidity, and yield of cottage cheese made from normal and reconstituted skim milk. Wash waters within the range of 50° to 80° F. had no apparent effect upon the physical properties of cottage cheese made from dry skim milk.

Varying the method of reconstituting the skim milk caused a change in the yield of cheese and in the percentage acidity at the time of setting, cutting, and draining. The percentage moisture and moisture-retaining properties were practically the same for cottage cheese manufactured from either normal or reconstituted skim milk. The same method of procedure could be used when different amounts of either spray processed or vacuum drum dry skim milk were used. The physical properties of the cheese made from reinforced skim milk were quite comparable with the cheese manufactured from normal skim milk. The percentage yield of cottage cheese from reinforced skim milk was proportionate to the amount of dry skim milk added. The temperatures and periods of setting, cutting, and draining were practically the same in the manufacture of cheese from either normal or reconstituted skim milk.

Bacteriology of butter.—V, Studies on the microorganisms in churns. H. C. OLSON and B. W. HAMMER (*Iowa Sta. Res. Bul.* 159 (1933), pp. 57-120, figs. 12).—Continuing this series of studies (E.S.R., 67, p. 308), a number of experiments were conducted to determine the microbiological condition of churns maintained under varying conditions.

Agar disk counts on 27 churns in commercial use in 24 Iowa butter plants showed quite a variation in microbiological condition. Bacteria were regularly much more numerous than yeast or molds, and molds were usually more numerous than yeasts. When bacterial counts were low, comparatively few species were present and organisms of the genus *Bacillus* and micrococci predominated, while when counts were high many species were commonly present, with yellow micrococci usually predominating. The washing method for some churns was inadequate, and in some cases they were left with considerable moisture in them. Such churns generally had more or less of an objectionable odor. The general sanitary condition of the plant was a better index of the microbiological condition of the churn than the washing method.

With two churns regularly given a thorough treatment with hot water, the agar disk counts showed some variations in number of organisms present, but the numbers were comparatively small. The relation of bacteria to molds and yeast in these churns was the same as above.

Using a solution of sodium hypochlorite, chlorinated lime, or calcium hypochlorite on churns treated with hot water resulted in very definite reductions in number of bacteria present. They also reduced the number of yeasts and molds. Using a cold, saturated sodium chloride solution on a churn treated with hot water did not reduce the number of bacteria, yeasts, or molds.

Treating highly contaminated churns with hot water effected striking reductions in the number of organisms present and largely eliminated yeasts, molds, and nonresistant types. Using a solution of either sodium hypochlorite or a chloramine preparation on such churns resulted in large reductions in the number of organisms.

Exposing agar plates near a churn showed that bacteria, yeasts, and molds were regularly falling from the air in considerable numbers. The organisms also fell inside a churn with doors on the side but not in as great numbers as on the outside. Bacteria fell in greater numbers than yeasts or molds and molds in greater numbers than yeasts. Protecting the doors of a churn with muslin decreased the number of organisms falling inside the churn, especially the bacteria.

General observations indicated that serious contamination of butter sometimes occurs in churns that are treated carefully. In one instance this was due to a loose shelf support.

Of the 61 pure cultures of bacteria isolated from churns each brought about a change in unsalted butter stored at 59° F. The changes produced by the nonspore-forming rods and micrococci were more rapid and more extensive than those produced by the *Bacillus* type. Mixed cultures produced marked and generally rapid changes. Highly contaminated churns commonly contributed considerable numbers of bacteria to butter. There was no significant difference in the keeping quality of salted butter from clean and from contaminated churns at 32° or 45°. Unsalted butter from clean churns showed keeping qualities distinctly superior to similar butter from contaminated churns at both 32° and 45°. Unsalted butter deteriorated more rapidly than salted butter at both 32° and 45°, and the rate of deterioration was more rapid at the higher temperature. Rancidity was the most common defect of unsalted butter from contaminated churns and cheesiness the common defect in unsalted butter from clean churns.

Starter vs. non-starter butter, F. C. SPARKS (*Amer. Creamery and Poultry Prod. Rev.*, 73 (1932), No. 15, pp. 602, 604, 606, figs. 3).—To determine the effect of adding starter to sweet cream upon the score of the resultant butter, the Oregon Experiment Station made a study of 16 small churnings of starter-ripened cream and 16 of nonripened cream. In addition, 108 large churnings were used, half of which had starter added and half without starter.

With the small churnings the average score of the ripened-cream butter when fresh was 93.3, while at the same time the nonstarter butter had an average score of 92.4. After one month's storage at 45° F. the respective butters scored 93 and 92.5. The butter made in the large churns had an average score when fresh of 93.2 for the starter-ripened cream and 92.2 for the nonripened cream. After one month's storage at 45° the average scores were 91.7 and 91.8, respectively. Samples of every churning were stored for six months at from 0° to 10°. The average score of 25 samples made with starter was 93.3 when fresh and 92.4 after six months. A total of 13 samples of butter made without starter entered storage with a score of 92.3 and came out of storage with a score of 91.9. These results show that fine-quality butter can be produced from sweet cream to which starter has been added, and that such butter retains its quality during storage.

The freezing properties, stability, and physical qualities of chocolate ice cream, W. H. E. REID and W. E. PAINTER (*Missouri Sta. Res. Bul.* 185 (1933), pp. 24, figs. 3).—This study was undertaken (1) to find the composition of a mix that would whip as readily as vanilla, (2) to improve the flavor and stability of the ice cream so that it would compare favorably with vanilla ice cream, and (3) to develop improved methods of processing and freezing a modified chocolate ice cream mix.

The results showed that sugar decidedly depressed the ability of a chocolate ice cream mix to incorporate air, prolonged the freezing time, induced a lower temperature of the ice cream, and created a physical condition resulting in a

lower overrun. When added to a chocolate mix in excess of the normal amount, sugar made it difficult to obtain an overrun equal to that of a vanilla ice cream with the same amount of sugar. By properly balancing a chocolate mix with respect to the sugar content a mix was obtained that would freeze equally fast and would attain the same overrun as vanilla. When the sugar content of ice cream exceeded 17 percent it partially or totally submerged the chocolate flavor and caused the ice cream to have a sticky and soggy body and texture. A sugar content above normal prevented chocolate ice cream from remaining firm or retaining its stability in an electric cabinet tempered for vanilla ice cream.

Adding egg powder to a chocolate ice cream mix improved its whipping ability, increased the viscosity, and produced a smooth body and fine texture. The egg powder partially masked the chocolate flavor and removed some of the stickiness of mixes with high sugar contents. Aging improved the whipping ability of a chocolate mix and reduced the freezing time one half. Adding a normal amount of chocolate flavoring material to a basic mix with a normal sugar content caused some difference in freezing time, increased viscosity, and brought about a pronounced but true chocolate flavor. Reducing the normal amount of cocoa to three fourths or one half the normal amount used improved the flavor and produced a mix that froze equally as fast as vanilla. Chocolate flavoring material acted as a stabilizer, and a reduction of the gelatin content of the mix was recommended.

The surface tension of the different mixes containing variable amounts of sugar, egg powder, cocoa, and chocolate liquor was not appreciably affected. A saving in material and manufacturing costs resulted when the sugar, chocolate flavoring, and gelatin content of a chocolate mix was reduced. Such ice cream was more popular with the consumers because of its true, delicate chocolate flavor.

VETERINARY MEDICINE

Bacteriology: A text-book of microorganisms, F. W. TANNER (*New York: John Wiley & Sons; London: Chapman & Hall, 1933, 2. ed., pp. XVII+548, pls. 2, figs. 138*).—This is an introduction to bacteriology, the first edition of which appeared in 1928.

Practical bacteriology: An introduction to bacteriological technic, F. W. TANNER (*New York: John Wiley & Sons; London: Chapman & Hall, 1933, 2. ed., pp. XIV+235, figs. [75]*).—A new edition of this work (E.S.R., 62, p. 166).

Parasitology of domestic animals for students of agriculture, I. B. BOUGHTON (*Parasitologie des Animaux Domestiques pour les Étudiants d'Agriculture. Port-au-Prince, Haiti: Serv. Tech., Dépt. Agr. et Enseig. Prof., 1931, pp. XIV+173, figs. [77]*).—This is a practical account of the parasitic enemies of domestic animals in Haiti.

The immunology of parasitic infections, W. H. TALIAFERRO (*New York and London: Century Co., 1929, pp. XV+414, figs. 28*).—Following the main text of this volume (pp. 3-296), the author presents a catalog of the parasites considered in the volume together with their common hosts (pp. 299-307) and an extended list of references to the literature (pp. 309-386).

Outlines of clinical diagnosis of internal diseases of domestic animals, B. MALKMUS, rev. by T. OPPERMAN (*Grundriss der Klinischen Diagnostik der Inneren Krankheiten der Haustiere. Leipzig: Max Jänecke, 1933, 11. ed., rev., pp. VII+264, pl. 1, figs. 71*).—A new edition of this work which has been revised by Oppermann, the eighth and ninth editions of which have been noted (E.S.R., 45, p. 176).

[**Studies on animal diseases in Nebraska**] (*Nebraska Sta. Rpt.* [1932], pp. 7, 8, 9, 10).—The work of the year is briefly referred to, including a study of the epizootological behavior under controlled environment of bacillary white diarrhea, blackhead (turkeys), tuberculosis, fowl cholera, coccidiosis, and fowl typhus, and of methods of practical control and economic effect of contagious abortion upon a dairy herd.

Report of the veterinary director general for the year ending March 31, 1932, G. HILTON ET AL. (*Canada Dept. Agr., Rpt. Vet. Dir. Gen., 1932*, pp. 53).—Included in this report (E.S.R., 67, p. 450) is an account of work with contagious diseases by A. E. Cameron (pp. 15-21) and of pathological work by E. A. Watson (pp. 45-53).

[**Contributions on animal pathology**] (*Arch. Wiss. u. Prakt. Tierheilk.*, 60 (1929), Nos. 1, pp. 3-98, figs. 19; 2, pp. 101-190, figs. 48; 3, pp. 193-289, figs. 29; 4, pp. 293-375, figs. 21; 5, pp. 377-466, figs. 34; 6, pp. 469-564, figs. 14).—The contributions here presented (E.S.R., 65, p. 868) include the following: Studies of the Pathological Anatomy and Pathogenesis of Tuberculosis in Domestic Animals—I, The Primary Complex in the Calf, by K. Nieberle (pp. 3-20); Outbreaks of Osteomalacia in Grazing Cattle Caused by Hydrofluoric Acid in Factory Smoke, by E. Hupka and P. Luy (pp. 21-39); Bacillary White Diarrhea and Its Relation to Hemorrhagic Septicemia, by K. Beller and A. Latif (pp. 40-67); A New Specific Method of Serodiagnosis for Glanders, by F. Menck (pp. 68-83); The Selection, Diseases, and Handling of Lymph-Virus Inoculated Animals and the Influence of the Inoculated Animals on the Quantity and Quality of Lymph, by E. Henriesson (pp. 84-98); The Resistance of Foot-and-Mouth Disease Virus to the Rays of the Quartz Lamp, Sunlight, and Sollux Lamp and the Effect of Irradiation upon the Course of Foot-and-Mouth Disease in Guinea Pigs, by K. Trautwein (pp. 101-110) (E.S.R., 62, p. 668); Can Piroplasmiasis Be Transmitted through the Injection of Foot-and-Mouth Disease Serum? by O. Roemmele (pp. 111-122); Foot-and-Mouth Disease in Cats, by K. R. Höve (pp. 123-148); The Influence of Foot-and-Mouth Disease on the Composition of Milk, Particularly the Fat Content, by A. Brandt (pp. 149-165); Foot-and-Mouth Disease of the Goat from Artificial Infection, by K. Reppin (pp. 166-190); New Methods of Antigen Production, by R. Helm (pp. 193-208); Tests with Certain Disinfectants upon the Virus of Foot-and-Mouth Disease, II, by R. Helm and W. Wedemann (pp. 209-234) (E.S.R., 65, p. 868); A Case of Multiple Exostosis in the Deer (concerning the Problem of Hypertrophic Osteo-arthropathy of Marie), by N. Ball (pp. 235-242); Periarteritis Nodosa of the Coronary Artery in Swine, by H. Wokken (pp. 243-247); Chronic Progressive Bulbar Paralysis in the Horse, by W. Ispolatow (pp. 248-252); Botelho's Test in Veterinary Practice, by W. Uwaroff (pp. 253-258); Experimental Rachitis in Rats—VI, Roentgenological Findings (pp. 259-272), and VII, Histological Findings in the Bones (pp. 273-289), both by O. Schultz (E.S.R., 65, p. 870); Studies of the Pathological Anatomy and Pathogenesis of Tuberculosis in Domestic Animals—II, The Generalization of Tuberculosis in the Calf, by K. Nieberle (pp. 293-311) (see above); Traumatic Femoral Luxation in the Dog, by O. Überreiter (pp. 312-329); The Blood of Healthy and Diseased Horses, by Dremjatsky, Posrednik, Turandin, Uwaroff, and K. Zwetkoff (pp. 330-340); The Resistance of the Virus of Fowl Pox and Fowl Diphtheria to Chemical Disinfectants, by Richters (pp. 341-344); The Action of Hexachlorethane on the Isolated Small Intestine of the Bovine, by H. Graf and M. Willimczik (pp. 345-353); Investigations of the Power of Adsorption of Some Medicinal Preparations of Charcoal, by P. Hofmann (pp. 354-361); The Nacerisch Book of Abu Bekr ibn Bedr: A Contribution to the Knowledge of

Medieval-Oriental Veterinary Medicine, by R. Froehner (pp. 362-375); The Influence of the Weather on the So-called Colics of the Horse, by D. Wirth and E. Gratzl (pp. 377-389); The Therapeutic Value of Oxygen Inhalation and of Subcutaneous and Intravenous Injection of Oxygen in Veterinary Medicine, by Richters (pp. 390-409); The Pathological Changes of the Spleen in Bird Malaria, by O. Nitsche (pp. 410-425); The Importance of the Fibrillae in the Histological Diagnosis of Carcinoma and Sarcoma in Animals, by K. Jármai (pp. 426-440); The *Bacillus gigas*, II, by J. Zeissler and F. C. Kraneveld (pp. 441-443) (E.S.R., 65, p. 870); Adams-Stokes' Syndrome in Partial Heart Block in Horses, by D. J. Krinizin (pp. 444-463); Furious Inoculation Rabies of the Rabbit, by F. Schnauder (pp. 464-466); Studies of the Pathological Anatomy and Pathogenesis of Tuberculosis in Domestic Animals—III, The Chronic Pulmonary Tuberculosis of the Bovine, by K. Nieberle (pp. 469-488) (see above); Determination of the Quantity of Blood, Blood Letting, and Blood Transfusion in Animals, by H. Rosenberg, R. W. Seuffert, H. Kalenscher, and W. Wittholz (pp. 489-505); Our Present Knowledge of the Value of Schilling's Hemogram Method in the Diagnosis of Some Infectious Diseases of Animals, by E. Totzeck (pp. 506-533); The Evaluation of Milk from Streptococci-Infected Cows in the Framing of Sanitary Police Regulations for Food Products, by M. Seelemann (pp. 534-552); The So-called Melanosis of the Kidneys of Cattle, by A. Hemmert-Halswick (pp. 553-561); and Investigation of the Treatment of Equine Piroplasmiasis with Preparation 270, by S. A. Amanschuloff, P. N. Arbusoff, and A. Schurawleff (pp. 562-564).

[Contributions on animal pathology] (*Arch. Wiss. u. Prakt. Tierheilk.*, 61 (1930), Nos. 1, pp. 1-77, figs. 23; 2, pp. 81-180, figs. 28; 3, pp. 181-274, figs. 21; 4, pp. 277-371, figs. 47; 5, pp. 373-460, figs. 5; 6, pp. 465-559, figs. 14).—The contributions presented include the following: On the Nature of the So-called Enzootic Hepatitis of the Young Pig, by W. Nussbag (pp. 1-37); Some Affections of the Cornea of the Dog—V, Keratitis Ulcerosa, by H. Veenendaal (pp. 38-50) (E.S.R., 65, p. 870); Leucocyte Count and Differentiation with Prym's Hemocytometer, by A. Meyer (pp. 51-64); The Application of Extradural Anesthesia in Dogs and Cats, by I. E. Powashenko (pp. 65-77); Studies of the Pathological Anatomy and Pathogenesis of Tuberculosis—IV, The Chronic Pulmonary Tuberculosis of the Bovine, by K. Nieberle (pp. 81-104) (see above); Blood Pressure Measurement of Diseased Horses with Plesch's Tonoszillograph, by Hornung and M. Torgut (pp. 104-113); The Pathological Changes Caused by *Linguatula rhinaria* Pilger, by N. Sysak and W. Bykow (pp. 114-117); Hemorrhagic Diathesis Due to the Toxic Action of Moldy Sweetclover Hay, by F. Volkmar (pp. 118-127); A Contribution on the Infection of the Bull with *Brucella abortus*, by J. Witte (pp. 128-140); The Problem of Foot-and-Mouth Disease of the Bovine, by A. L. Skomorochow (pp. 141-143); Investigations of the Etiology of Moon Blindness—II, Cooperative Studies with M. Berrár, by R. Manninger (pp. 144-172) (E.S.R., 65, p. 870); The Evaluation of Milk from Streptococci-Infected Cows in the Framing of Sanitary Police Regulations for Food Products: A Supplement to the Article by M. Seelemann, by H. Haupt (pp. 173-176) (see above); Principles of the Evaluation of Milk from Streptococci-Infected Cows in the Framing of Sanitary Police Regulations for Food Products: A Reply to the Above Contribution by H. Haupt, by M. Seelemann (pp. 177-180); Investigations of the Streptococcic Mastitis of the Cow, with Particular Reference to Its Sanitary Importance, I, by K. Diernhofer (pp. 181-209); A Critical Study of Chloral Hydrate Narcosis in Dogs, by W. Freese (pp. 210-234); Allergic Reactions in Ascariasis of the Horse, by N. H. Girg (pp. 235-251); The Distribution of *Pentastomum denticulatum* in Cattle in the

Union of Socialistic Soviet Republics and the Histology of Changes Produced by This Parasite in the Mesenteric Lymph Nodes, by N. Bogdaschew (pp. 252-263); Spirochetosis of the Fowl, Duck, and Goose in Uralsk and Its Environs, by W. L. Yakimoff, S. A. Amanschouloff, P. N. Arbouzoff, and A. A. Samarzeff (pp. 264-266); Principles of the Evaluation of Milk from Streptococci-Infected Cows in the Framing of Sanitary Police Regulations for Food Products: Observations on the Contribution of Seelemann, by H. Haupt (pp. 267-274) (see above); Studies of the Pathological Anatomy and Pathogenesis of Tuberculosis—V, The Udder Tuberculosis of the Bovine, by K. Nieberle (pp. 277-295) (see above); Investigations of the Streptococcic Mastitis of the Cow, with Particular Reference to Its Sanitary Importance, II, by K. Diernhofer (pp. 296-322) (see above); Luxation of the Atlas in the Dog, by A. Pommer (pp. 323-332); Congenital and Hereditary Hypoplasia of the Optic Nerve and the Retina with Amotio Retinae in the Dog, by M. Westhues (pp. 333-343); The Mallophaga of Domestic Animals, II, by M. Zunker (pp. 344-358) (E.S.R., 65, p. 869); A Case of Putrid-Ulcerous Endocardial and Myocardial Tuberculosis in the Bovine, by A. Trawiński and I. Maternowska (pp. 359-361); Agriculturally Important Diseases of Animals in East Africa, by E. Schäle (pp. 362-371); Emesis, with Particular Reference to the Bovine, by W. Hofmann (pp. 373-404); The Genesis of Vesicular Respiration, by J. v. Mócsy (pp. 405-422); Annular Media Necrosis and Cicatrix of the Thoracic Aorta of the Horse, by C. Krause (pp. 423-432); The Blood Groups of the Horse, by Z. Thomoff (pp. 433-444); A Contribution on Streptococcic Mastitis, II, by O. Pröscholdt (pp. 445-460) (E.S.R., 65, p. 869); The Guttadiaphot Method in Veterinary Medicine, by Schmey and Henke (pp. 465-484); Blackleg of Sheep and Its Control through Injection of Culture Filtrates and Formolized Vaccines, by K. L. Wolters (pp. 485-500); The Blood Pressure in Contagious Equine Pneumonia, by S. Mglej (pp. 501-510); The Effect of Ephedrine on Blood Pressure of the Horse, by Rüscher (pp. 511-521); Increased Virulence of the Foot-and-Mouth Disease Virus in Sensitized Guinea Pigs, by R. Helm (pp. 522-529); Skin Tuberculosis of Swine, by A. Trawiński and I. Maternowska (pp. 530-534); and Are the Berlin Rings Senile Changes? by R. von Schalscha (pp. 535-559).

Annual report of the Civil Veterinary Department, Punjab, for the year 1931-32, W. TAYLOR (*Punjab Civ. Vet. Dept. Ann. Rpt. 1931-32*, pp. II+5+36+XX, pls. 5).—Included in this report is an account of the occurrence of diseases of livestock, their prevention and treatment.

[Contributions on animal pathology and parasitology] (*N. S. Wales Dept. Agr., Vet. Res. Rpt.*, 6 (1931), pt. 3, pp. [2]+95-136, pls. 4).—In this third part (E.S.R., 66, p. 666) the following contributions are presented: A Specific Arthritis in Sheep, by H. R. Seddon and H. R. Carne (pp. 95-108); Cross-Immunity Tests with Virus of Infectious Labial Dermatitis of Sheep, by H. R. Seddon and T. T. McGrath (pp. 109, 110); Occurrence of *Cooperia curticei* in Sheep in New South Wales, by T. T. McGrath (pp. 111-113); Toxicity of Certain Arsenic and Lead Compounds for Sheep, by H. R. Seddon and A. A. Ramsay (pp. 113-118); *Nicotiana suaveolens* (Native Tobacco) Proved Poisonous to Sheep, by H. R. Seddon and T. T. McGrath (pp. 119-121); *Pimelea pauciflora* (Scrub Kurrajong) Proved to Be Toxic for Sheep, by H. R. Seddon, W. L. Hindmarsh, and T. T. McGrath (pp. 122-125); Some Observations on *B[acterium] suispestifer* Septicaemia of Pigs—Preliminary Report, by W. L. Hindmarsh and G. Edgar (pp. 126-131); and Pyaemic Hepatitis of Sheep, by W. L. Hindmarsh (pp. 132-135).

Poisonous plants and plant products, O. A. STEVENS (*North Dakota Sta. Bul.* 265 (1933), pp. 30, figs. 20).—This is a practical account of the subject as related to North Dakota.

Ragwort poisoning in cattle in Victoria, D. MURNANE (*Jour. Council Sci. and Indus. Res. [Aust.]*, 6 (1933), No. 2, pp. 108-110).—The author found that ragwort (*Senecio jacobaea*) in the Gippsland district of Victoria is toxic to cattle and is responsible for losses in dairy herds in that locality.

A report of some investigations into the cause of sweet clover (*Melilotus*) disease, J. M. BROWN, A. SAVAGE, and A. D. ROBINSON (*Sci. Agr.*, 13 (1933), No. 9, pp. 561-565).—Investigations in Manitoba indicate that sweet-clover disease is not associated with either calcium or phosphorus interference. "The belief generally held that only mold-damaged sweetclover is capable of causing the disease is not substantiated by these experiments. On the contrary, disease was induced in our experimental subjects by feeding a sweetclover hay relatively mold free. Furthermore, feeding of heavily molded sweetclover artificially inoculated with a mold isolated from sweetclover proven pathogenic failed to induce disease. A dark brown coloration and tobacco-like odor seem to be typical of sweetclover possessed of disease-producing qualities."

Nicotine poisoning by absorption through the skin, J. M. FAULKNER (*Jour. Amer. Med. Assoc.*, 100 (1933), No. 21, pp. 1664, 1665).—The author reports upon a case of nicotine poisoning resulting from accidental absorption through the skin of "Nico Fume Liquid", a 40 percent solution of free nicotine. In experiments with cats it was found that small amounts of this substance applied to the intact skin were readily absorbed with fatal results. It was observed that the insecticide "Black Leaf 40", containing 40 percent of the sulfate salt of nicotine, produced no toxic symptoms when applied to the skin of the cat.

Pyrethrum a safe winter control for insect pests of livestock, C. B. DIBBLE (*Michigan Sta. Quart. Bul.*, 15 (1933), No. 4, pp. 219-221, figs. 4).—This is a practical account in which the author suggests the use of pyrethrum powder for control of lice and sheep ticks during the winter months when other methods are undesirable.

A serological differentiation of human and other groups of hemolytic streptococci, R. C. LANCEFIELD (*Jour. Expt. Med.*, 57 (1933), No. 4, pp. 571-595).—The data presented in this paper show that hemolytic streptococci can be differentiated serologically by means of the precipitin reaction into distinct and sharply defined groups which are not disclosed by the agglutination reaction. The test is relatively simple and gives results which are strikingly uniform and consistent. The reagents essential in carrying out the test are heat and hydrochloric acid extracts of the micro-organisms and the sera of rabbits immunized with formolized cultures.

All except 2 of 106 strains of hemolytic streptococci isolated from man, other animals, milk, and cheese were classified into five groups (A, B, C, D, E) which bear a definite relationship to the sources of the cultures. These two strains were different from all others in the series. Ten strains of *Streptococcus viridans*, included as controls, did not fall into any of these groups. "The animal source was closely correlated with this grouping. Thus, group A comprised chiefly strains of human origin; group B, chiefly strains of the high acid-producing, sodium hippurate-hydrolyzing variety isolated from bovine and dairy sources; group C contained strains from a variety of animal sources and included those strains of bovine origin which attained an intermediate final pH of about 4.8 and did not hydrolyze sodium hippurate; group D included strains from cheese only; and group E comprised three strains from certified milk, and may be only a small number representing a larger group. Doubtless, other groups would be found if streptococci from other sources were examined,

but this series seems sufficient to establish the principle of specific group differentiation by serological methods."

The specific group classification is made possible by employing two special reagents, (1) extracts prepared by treatment of the bacteria with hot hydrochloric acid and (2) serum of animals immunized with formolized cultures. This differentiation is not detected by the agglutination reaction. The grouping agrees with that described by other investigators on the basis of cultural and biochemical characteristics. Members of the groups differentiated by either method can usually be distinguished by their biochemical characteristics; they are, however, much more easily and specifically identified by the anti-C precipitin test.

The group-specific substances present in strains of group A and B have been identified chemically as carbohydrate in nature. The chemical composition of the specific substances upon which the specificity of the other groups depends has not been determined.

Anaplasmosis, III, IV, G. DIKMANS (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 6, pp. 855-870, fig. 1).—Part 3 of this contribution (E.S.R., 69, p. 426) deals with a further experimental demonstration of the identity of anaplasmosis in Louisiana (pp. 855-861) and part 4 with the carrier problem, including tick transmission (pp. 862-870).

The identification of *Brucella* isolated in France by the bacteriostatic action of dyes and the production of hydrogen sulfide (Huddleson).—First memoir [trans. title], R. M. TAYLOR, M. LISBONNE, and G. ROMAN (*Ann. Inst. Pasteur*, 49 (1932), No. 3, pp. 284-302).—One hundred and twenty-nine of 131 strains of human origin were typed by the dye, H₂S, and CO₂ methods as representing *B. melitensis* and 2 as representing *B. abortus*; 38 of 41 strains of bovine origin were typed as *B. abortus bovis* and 3 as *B. melitensis*; 9 of 10 strains of ovine origin were typed as *B. melitensis* and 1 as *B. abortus bovis*; and 6 strains of caprine origin were typed as *B. melitensis* and 3 strains of equine origin as *B. abortus bovis*.

Studies on experimental transmission of virus of "eruptive fever" and "typhus" by several blood sucking insects, M. KODAMA and M. KŌNO (*Kitasato Arch. Expt. Med.* [Tokyo], 10 (1933), No. 2, pp. 99-112).—Notes are given on the transmission of the virus of such diseases in Manchuria by fleas and lice, presented in connection with a list of 20 references to the literature.

Spontaneous paratyphoid infection of the pigeon by the Aertryck or Breslau type of *Salmonella*: Experimental vaccination [trans. title], C. CERNAIANU and I. POPOVICI (*Compt. Rend. Soc. Biol.* [Paris], 112 (1933), No. 8, pp. 829-832).—The authors report that paratyphoid of pigeons, not previously reported from Rumania, occurs in that country and is always caused by the Breslau or Aertryck type of the *Salmonella* organism. Young pigeons are particularly susceptible to this organism. Vaccination experiments with a formolized gelatin culture have shown that a solid immunity against this disease in the pigeon can be secured, particularly by the intramuscular route, which is much more active than the oral. Vaccination even after pigeons became infected prevented further mortality and stopped the outbreak.

Paratyphoid-like fever in children due to the *Salmonella suispestifer* group, A. G. KUTTNER and H. D. ZEPP (*Bul. Johns Hopkins Hosp.*, 51 (1932), No. 6, pp. 373-387).—Seven cases of infection with bacilli of the hog cholera group (*S. suispestifer*) in children ranging from 7 months to 6 years are described. It is suggested that there may be some other source of infection than the pig.

Sporadic infections in Aberdeen due to food-poisoning organisms of the Salmonella group, J. SMITH (*Jour. Hyg. [London]*, 33 (1933), No. 2, pp. 224-232).—In an investigation made of sporadic *Salmonella* infections, *S. aertrycke* and *S. thompson* were found to be the most prevalent infecting organisms. Infections due to *S. dublin* and *S. suispestifer* (both European and American types) were also encountered. The number of individual cases and the lack of definite evidence of the source of the infection were striking features of the investigation.

Some experiences respecting the so-called Streptococcus mastitis [trans. title], F. GUSTAFSON (*Skand. Vet. Tidskr.*, 23 (1933), No. 1, pp. 1-11; *Eng. abs.*, pp. 10, 11).—In this account the author considers the nature of the disease, its cause and symptoms, and the manner in which it can be recognized and combated.

An unusual case of chronic rinderpest, with special reference to the carrier problem in this disease, S. C. A. DATTA and V. R. RAJAGOPALAN (*Indian Jour. Vet. Sci. and Anim. Husb.*, 2 (1932), No. 4, pp. 357-382, figs. 5).—In the inoculation experiments reported it was found that the spleen collected from an animal dying from rinderpest 74 days after the initial inoculation was infective by inoculation into susceptible bulls, while the blood was not. The persistence of rinderpest lesions in the alimentary tract with accompanying infectivity of the spleen over such a long period is considered remarkable. From the data given there seems to be no doubt that the lesions exhibited at post-mortem examination were due to the infection contracted at the original inoculation, there being no room for an accidental second infection.

Rinderpest: Transmission of infection by contact, H. COOPER (*Indian Jour. Vet. Sci. and Anim. Husb.*, 2 (1932), No. 4, pp. 383-392).—In the experiments described rinderpest spread by direct contact from artificially infected to healthy susceptible cattle at a slow rate. "The most contagious period in the rinderpest syndrome was found to be between the fifth and tenth days after artificial infection. Spread of infection was longer delayed from contact before the fifth day, and from the tenth to the fifteenth day the disease failed to spread to any one of three susceptible animals exposed to it, even after 68 days of contact."

Rocky Mountain spotted fever and boutonneuse fever: A study of their immunological relationship, L. F. BADGER (*Pub. Health Rpts. [U.S.]*, 48 (1933), No. 19, pp. 507-511, figs. 4).—The tests reported indicate that the tick-transmitted diseases boutonneuse fever and Rocky Mountain spotted fever are immunologically identical.

Animal susceptibility to Trypanosoma hippicum, the equine trypanosome of Panama, with special reference to cattle as an unharmed host and probable reservoir of importance, H. C. CLARK and L. H. DUNN (*Amer. Jour. Trop. Med.*, 13 (1933), No. 3, pp. 273-281, fig. 1).—The authors report upon a study made of animal susceptibility to *T. hippicum* in Panama, using as many wild and domestic animals which come in contact with horses and mules in the stable, pastures, or on the trails as could be collected. The horse, mule, and cattle were the only animals that disclosed a spontaneous infection with this trypanosome.

Microbic dissociation, with reference to the attenuated tubercle bacillus of Calmette and Guérin (B.C.G.), R. S. BEGBIE (*Edinb. Med. Jour.*, n. ser., 38 (1931), No. 3, pp. 174-182).—The author has found evidence of dissociation of B.C.G. into rough, smooth, and intermediate types. The experiments on guinea pigs have not given "clear-cut lines of demarcation in the virulence of

the types of growth obtained, but definite variation was noted, the 'smooth' type being most virulent, the 'rough' type intermediate in virulence, and the umbilicated or 'intermediate' type of growth the least virulent. A subculture of B.C.G. on Dorset's egg medium was more virulent than the intermediate type of growth; a fresh culture on a glycerol bile potato gave results similar to the intermediate type. This would appear to be explained by Petroff's statement that the S type of organism does not grow on glycerol bile potato, but that it grows on other media. Of the 42 guinea pigs used for the experiments, 5 died of vague intercurrent conditions on the eighteenth day or later after inoculation, and they were all animals which had received intracardiac inoculations. It is possible that, although not definitely tuberculous, their deaths were the result of some pathological condition set up by the injections."

Dissociation and variation of the attenuated bovine tubercle bacillus of Calmette and Guérin (B.C.G.) with reference to type-stability and virulence, M. H. CHRISTISON (*Zentbl. Bakt. [etc.]*, 1. Abt., Orig., 125 (1932), No. 1-2, pp. 72-83, figs. 16).—The author has found B.C.G. to dissociate into S and R forms as described by S. A. Petroff, A. Branch, and W. Steenken, Jr.,¹ into the S form described by Begbie (as above noted), and also into other atypical forms. "The S variant is extremely unstable when replated on Petroff's medium, but the R variant is relatively stable, although it exhibits a wide variety of colony types. Undissociated B.C.G. as received from the Pasteur Institute or after six subcultures on glycerine-egg medium and an S colony described by Begbie are avirulent for guinea pigs. Growth from subcultures of R and I variants when injected into guinea pigs exhibits only a low degree of virulence. S variants and their subcultures are somewhat more virulent."

Protection against tuberculosis with BCG vaccine in guinea-pigs, K. E. BIRKHAUG (*Ann. Inst. Pasteur*, 49 (1932), No. 5, pp. 630-652; *Fr. abs.*, pp. 651, 652).—The author considers the experimental data here presented to indicate that B.C.G. is harmless as a vaccine and is capable of arousing an outstanding and significant immunity to tuberculosis when administered to guinea pigs by the parenteral routes.

Further studies on a comparison of the Huddleson slide test with the macroscopic tube test in undulant fever, H. WELCH and F. L. MICKLE (*Jour. Lab. and Clin. Med.*, 18 (1933), No. 6, pp. 627-636).—In further studies (E.S.R., 66, p. 871) the authors have found the Huddleson rapid method (E.S.R., 59, p. 78) to be an accurate and efficient means for the diagnosis of *Brucella* infection in man. "Fewer questionable reactions are obtained with the Huddleson rapid method than with the two tube test methods used. A series of cases are presented in which, although no symptoms of undulant fever were demonstrated, high-titered agglutinins were present. *Brucella* infections may be present but not recognizable because of mild symptoms, particularly in young adults and children. This investigation furnishes additional evidence for the substitution of the term '*Brucella* infection' in place of undulant fever."

A study of undulant fever in the Punjab caused by *Brucella abortus* (Bang.), S. R. HASSAN (*Arch. Schiffs u. Tropen Hyg.*, 37 (1933), No. 3, pp. 121-130).—The author concludes that cases of undulant fever in the Punjab are common, and that the infection conveyed by cattle is in no way less than that conveyed by the goat. Close contact with infected animals is considered the chief source.

¹ Soc. Expt. Biol. and Med. Proc., 25 (1927), No. 1, pp. 14-17, figs. 2.

Parasites affecting domestic animals, G. A. ROBERTS (*Virgin Islands Sta. Rpt. 1932, pp. 15, 16*).—A list is given of the nematode, cestode, and trematode parasites of horses, mules, cattle, sheep and goats, swine, and dogs found by H. L. Van Volkenburg in February on the island of St. Croix. Data are also reported on the use of 1 percent copper sulfate and 0.75 percent nicotine sulfate in the control of stomach worms in calves, and of chloroform, 6 drops in each nostril with a later exposure to tar fumes for 20 to 30 minutes in a closed room, for lungworms; the finding in horses and mules suffering from aneurysms of the mesenteric arteries of thrombi and larvae of *Strongylus vulgaris*; and weakness and anemia in adult cattle on the western half of St. Croix, especially during the dry season.

On the action of anthelmintics on the migration of ascarid larvae: Experimental investigations [trans. title], G. G. SMIRNOW (*Ztschr. Wiss. Biol., Abt. F, Ztschr. Parasitenk., 3 (1931), No. 2, pp. 173-184*).—The author has found that anthelmintics, including santonin, sodium santoninate, and oil of Chenopodium, do not prevent the migration of larvae of the horse ascarid *Ascaris megalocephala* in the body of its host. A list is given of 13 references to the literature.

Semeiology of the blood of the Bovidae [trans. title], L. LAMARRE (*Rec. Méd. Vét., 109 (1933), No. 2, pp. 69-96, figs. 2*).—This is a report of a study made of the cellular and humoral constituents of the blood, in which the studies of earlier investigators are compared.

Actinobacillosis of cattle in the United States, L. THOMPSON (*Jour. Infect. Diseases, 52 (1933), No. 2, 223-229, fig. 1*).—It is pointed out that the clinical or pathological condition of cattle known as actinobacillosis and actinomycosis is caused by several agents, the two most significant of which are *Actinomyces bovis* and *Actinobacillus lignièresi*. The condition met with in the United States is similar to that in other countries where the greater percentage of the so-called bovine actinomycosis is due to *A. lignièresi*, the condition known as "wooden tongue" probably being entirely due to this organism. Most cases of involvement only of the cervical glands were due to *A. lignièresi*, while, on the other hand, the few cases of infection of bone encountered were due to *Actinomyces bovis*.

A method for the preparation of antigen for the rapid agglutination test for Bang's disease with a technic for conducting such test, C. R. DONHAM and C. P. FITCH (*Jour. Amer. Vet. Med. Assoc., 82 (1933), No. 6, pp. 913-921, figs. 3*).—Contributing from the Minnesota Experiment Station, the authors describe a technic for the preparation of rapid-test *Bacterium abortus* agglutination antigen which, within itself, constitutes a standard for this test and is not in any way dependent on the tube test.

Vaccination against contagious bovine abortion, J. F. D. TUTT (*Vet. Rec., 13 (1933), No. 21, pp. 494-498*).—Reporting briefly upon vaccination for bovine infectious abortion in 11 herds, the author is led to conclude that inoculation with living cultures checked the losses. The evidence as regards its effect on fertility was very slightly in favor of none being exercised in the proportion of 6 to 5.

The persistence of Brucella agglutinins in calves of reactor cows, F. THORP, JR., and R. GRAHAM (*Jour. Amer. Vet. Med. Assoc., 82 (1933), No. 6, pp. 871-874, fig. 1*).—In the authors' studies calves from reacting as well as nonreacting cows in one herd harboring Bang's disease, that were allowed in the majority of instances to nurse their dams for a period of 5 to 7 days, were tested repeatedly for *Brucella* agglutinins. The first test was made when the

calf was 4 to 48 hours old. Calves were removed from the herd to disease-free quarters on the basis of two monthly negative tests.

"One hundred and eighteen calves from negative cows were consistently negative to *Brucella* agglutinins. Twenty-one of 49 calves from positive reactors and 2 of 6 calves from suspicious reactors were positive on the initial test but became negative in 6 months or less. Seven of the 28 calves from positive cows, negative on initial test, became positive. All proved negative in 6 months or less."

The effect of *Brucella abortus* infection on the normal udder of a healthy cow, D. A. GILL (*Vet. Jour.*, 89 (1933), No. 4, pp. 159-165).—In the detailed study of a cow experimentally infected with *B. abortus* the following points were clearly demonstrated: "(1) A cow with a strongly positive serum and yielding *B. abortus* from all four quarters may yet show no agglutinins in the whey; (2) *B. abortus* can cause a low-grade mammitis on becoming established in the udder, and this can continue for some months; (3) subsequently the udder may cease to react to its presence, and the inflammation subside entirely, although *B. abortus* is still being shed in the milk; (4) the udder may pass through such a phase as the above without its normal flora being materially changed during the course of it; [and] (5) it is very possible that *B. abortus* infection may be one, among many possible factors, capable of paving the way for streptococcal mammitis."

Experimental bovine mastitis, F. B. HADLEY and W. D. FROST (*Vet. Alumni Quart. [Ohio State Univ.]*, 21 (1933), No. 1, pp. 1-5).—This contribution reports seven cases studied in connection with the work previously noted (E.S.R., 69, pp. 274, 429).

The correlation between certain properties of milk and the type of inflammation in acute mastitis, R. B. LITTLE and F. S. JONES (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 6, pp. 818-825).—The authors have studied the milk from acute cases of mastitis from the standpoint of its leucocyte content, the quantity of whey proteins as determined volumetrically, and the pH. These factors have been correlated with udder infection. "In general there is a close correlation between bacterial invasion and leucocytosis. In many cases the whey proteins are measurably increased in volume, and in many instances the reaction of the milk is altered, usually toward the alkaline side. The manifested changes in the milk have been related to the severity and character of the inflammatory process."

The relation of bovine mastitis to human infection, P. R. BROOKS (*Jour. Prev. Med.*, 6 (1932), No. 2, pp. 111-116).—It is pointed out that while the types of streptococci which are common incitants in mastitis among dairy cattle apparently are not infective for man, when present in milk in large numbers with their toxins they may be responsible for severe toxic disturbances, especially in children. However, organisms of animal or human origin pathogenic for man, including the tubercle bacillus, *Brucella abortus*, and the hemolytic streptococci which are incitants of septic sore throat and scarlet fever, may be present in diseased udders.

A study of bovine coccidiosis, II, I. D. WILSON and L. C. MORLEY (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 6, pp. 826-850).—In this second contribution from the Virginia Experiment Station (E.S.R., 65, p. 774), the authors report upon experimental work conducted. They conclude that "natural infection probably results from a continuous ingestion of small numbers of ripened oocysts, immune carriers spreading the organism. The natural resistance of calves may vary. An acquired immunity, which protects the animal against subsequent infections for at least 5 months, may result from a severe coccidial infection. Old animals, as a rule, probably have a well-developed immunity."

"In this study there was found to be no correlation between the amount of infective material fed to a susceptible calf and the resulting infection. Failure to produce severe artificial infections has suggested the possibility of some predisposing factor. It is believed that sporulation of the oocysts in potassium dichromate may attenuate them to some extent. There does not seem to be a definite cyclical character of development with a limited number of asexual generations in bovine coccidiosis. Evidence indicates that the course of the infection is influenced by the resistance, or immunity, of the host, which determines whether the development of the parasite will be either sexual or asexual.

"Nonsporulated oocysts will probably survive the winter temperatures encountered in Virginia. Nonsporulated oocysts seem to retain their viability at refrigeration temperature longer than sporulated ones. Both nonsporulated and sporulated oocysts are destroyed readily by the action of sunlight, drying, and putrefaction. Sporulated oocysts taken from cattle and fed to young rats were not digested. It was found impossible to sporulate any great numbers of bovine coccidia unless a preservative was used. Copper sulfate seems to be as satisfactory as potassium dichromate as a preservative for sporulating bovine coccidia. Sporulation time for some of the species of bovine coccidia is not so long as is commonly believed. The morphologic characteristics of one type of oocyst encountered appeared not to conform to any of the described bovine species."

Coccidioidal granuloma in cattle in Colorado, G. W. STILES, JR., M. S. SHAHAN, and C. L. DAVIS (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 6, pp. 928-930).—This is a report of a case which occurred in a fat 2-year-old heifer from a feed lot in northern Colorado.

Discovery of the cause of nasal granuloma in cattle.—Preliminary report, P. G. MALKANI (*Indian Vet. Jour.*, 9 (1933), No. 4, pp. 257-277, pls. 10).—The author finds nasal granuloma to be due to a schistosoma which somewhat resembles *Schistosoma spindalis* Montg., but possesses some distinctive features which indicate that it is a distinct species. Nasal granuloma does occur in buffaloes, although rarely, and the species of schistosomes responsible for the condition appears to be identical with the one responsible for the disease in cattle. Tartar emetic is not only a curative but a valuable prophylactic in this disease, and its systematic application would result in complete eradication. Microscopic examination of the nasal discharge is the best means of diagnosing the disease and estimating the total amount of the specific drug required in a particular case.

Diagnosis of streptococcic mammitis of the cow by seroagglutination [trans. title], LESBOUYRIES and ADAM (*Bul. Acad. Vét. France*, 6 (1933), No. 2, pp. 61-66).—The authors conclude that seroagglutination constitutes a good method for diagnosing clinical and inapparent cases of streptococcic mammitis.

A complicated case of parturient paresis, J. F. BULLARD (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 6, p. 927).—This is a report from the Indiana Experiment Station of a case in which the acute tympanitic condition masked the symptoms of parturient paresis so completely that the latter condition was not recognized until the tympanites was relieved.

Experimental chemotherapy of the bovine piroplasmoses [trans. title], E. SERGENT, A. DONATIEN, L. PARROT, and F. LESTOQUARD (*Bul. Soc. Path. Exot.*, 26 (1933), No. 4, pp. 600-605).—The authors' chemotherapeutic work with the piroplasmoses of bovines in North Africa, in which many products were tested, has led to the conclusion that trypan blue at a dose of 0.2 g, followed by piro blue at a dose of 1 g (containing 0.2 g of trypan blue), and gonacrine at a dose of 1 g are effective against *Piroplasma bigeminum*. Ichthargan is a specific when used against *Babesiella berbera*.

Bovine piroplasmosis in Costa Rica [trans. title], A. E. HERNÁNDEZ V. and J. L. ZÚÑIGA H. (*Cent. Nac. Agr. [Costa Rica] Bol.* 14 (1933), pp. 26, pl. 1, figs. 8).—An account of piroplasmosis of cattle in Costa Rica, where it is transmitted by *Boophilus australis*.

Some further studies on the etiology of bovine haematuria vesicalis (red water) in British Columbia, W. H. HILL, H. M. KING, and D. G. LAIRD (*Sci. Agr.*, 13 (1933), No. 9, pp. 545-560).—In the course of a study of this disease in British Columbia a detailed analysis of soils, feeding stuffs, waters, and other materials from red water and non-red water farms was compiled and comparisons made between them.

It was found that "red water occurs on farms where the soils are comparatively low in fertility. The soils are of an acid nature, readily leached, with a tendency to be low in phosphate, nitrogen, and organic matter. The hays and other roughages are generally low in available mineral elements. The herbage is significantly high in silica and aluminum, and possibly low in manganese. The probable causation of the disease is of nutritional origin, either from ingested irritant material or from material elaborated in the animal's system during metabolism. Further investigational work should be conducted on the composition of the urines, bladders, flesh, and milk of diseased animals."

A list is given of 63 references to the literature cited.

Experiments on immunization against "triesteza" (piroplasmosis and anaplasmosis) of cattle [trans. title], A. OMLIN (*Schweiz. Arch. Tierheilk.*, 74 (1932), No. 12, pp. 559-569).—The author has found that cattle can be immunized against *Piroplasma bigeminum* infection by the injection of infected blood from a carrier and then controlling the subsequent reaction by intravenous injections of piroblue. Immunization against the very virulent *Anaplasma marginale* infection was accomplished by a preliminary injection of blood containing the relatively nonvirulent *A. centrale*.

On the identity of the schistosome found in cases of bovine nasal granuloma and some observations on a few other members of the Schistosomidae, G. D. BHALERAO (*Indian Jour. Vet. Sci. and Anim. Husb.*, 2 (1932), No. 4, pp. 338-356, pls. 7).—This contribution deals with the morphology and taxonomy of the schistosome found in bovine nasal granuloma tissue, together with notes on a few other schistosomes.

Tuberculosis of the udder in cows: An experimental study [trans. title], H. HEDSTRÖM (*Skand. Vet. Tidskr.*, 22 (1932), No. 12, pp. 628-642, figs. 9; *Eng. abs.*, pp. 641, 642).—The author reports upon the results of a clinical examination, an examination of milk samples, and a histological examination of tissue samples taken from the udder with a trocar following infection through the teat canal, with 15 cc 0.1 volume-percentage tubercle bacillus emulsion, of one quarter of the udder of a cow.

Experimental tests of the immunizing power of B.C.G. vaccine [trans. title], H. HEDSTRÖM (*Skand. Vet. Tidskr.*, 22 (1932), No. 11, pp. 570-588; *Eng. abs.*, pp. 587, 588).—The author concludes that B.C.G. vaccine is able to increase the power of resistance of cattle against a subsequent infection with tubercle bacilli.

The identification of *B. ovitoxicus* type of toxin from the intestine of sheep in Great Britain, R. F. MONTGOMERIE and T. DALLING (*Vet. Jour.*, 89 (1933), No. 5, pp. 223, 224).—"Filtrates of the intestinal contents of lambs dead of 'pulpy kidney' and of ewes dead of 'strike' contain a toxin which is lethal to mice and sheep when injected intravenously and which is neutralized by antisera of *B[acillus] ovitoxicus* (Bennetts) and *B. welchii* (Wilsdon type

'D'). This toxin is neutralized by a batch of lamb dysentery serum produced prior to 1930, but not by batches of subsequent production. In the intestine of some lambs presenting clinical appearances of lamb dysentery a similar toxin has been found, whereas in other apparently similar cases a toxin is present which is neutralized only by lamb dysentery serum, all batches. *B. ovitoxicus* and *B. welchii* (Wilsdon type 'D') are at the least closely related."

The active immunization of sheep against infectious entero-toxaemia (braxy-like disease) by means of *B. ovitoxicus* anaculture, H. W. BENNETTS (*Jour. Council Sci. and Indus. Res. [Aust.]*, 6 (1933), No. 2, pp. 92-98).—This contribution, investigations of which problem have been noted (E.S.R., 67, p. 600), points out that sheep may be actively immunized against enterotoxemia by means of *Bacillus ovitoxicus* anaculture. "Two inoculations with 3 weeks' interval are recommended. During the 1931 and 1932 seasons, the mortality rate in controlled flocks was reduced by 85 percent as a result of inoculation. A small experiment indicated that lambs fattened on shed peas during the summer months can be satisfactorily immunized by this method. Lamb dysentery bacillus anaculture did not immunize guinea pigs against *B. ovitoxicus* toxin, although a response was obtained with *B. ovitoxicus* anaculture. *B. ovitoxicus* 'alum toxoid', tested on guinea pigs, did not possess any greater antigenic efficiency than *B. ovitoxicus* anaculture."

B. welchii, the "lamb dysentery bacillus", and *B. paludis*: An examination of single-cell cultures, J. H. MASON (*Vet. Jour.*, 89 (1933), No. 5, pp. 225-231).—In the author's studies single-cell cultures were prepared from the lamb dysentery bacillus *B[acterium] paludis*, and *B[acillus] welchii*. "Morphologically these germs cannot be distinguished one from the other. The only cultural difference is the fermentation of glycerine by *B. paludis* and *B. welchii* and the failure to do so by the lamb dysentery bacillus. No strain liquefied inspissated horse serum, and all clotted alkaline egg medium. The reactions in these media do not distinguish the one germ from the other. The antitoxins of the lamb dysentery bacillus and *B. paludis* (both original and single-cell cultures) neutralize the toxin of *B. welchii*. *B. welchii* antitoxin does not neutralize the toxins of these anaerobes. Serologically the chief fraction of the toxins of the lamb dysentery bacillus and *B. paludis* (both original and single-cell cultures) is identical."

The presence of an anticoagulin in the esophagus of *Bunostomum trigonocephalum* from the intestine of sheep, R. HOEPLI and L. C. FENG (*Arch. Schiffs u. Tropen Hyg.*, 37 (1933), No. 4, pp. 176-182).—The authors found that "saline extracts of the anterior portion (reaching to the posterior end of the esophagus) of *B. trigonocephalum* had a distinct inhibitory effect on the coagulation of rabbit blood in vitro when a small amount of extract was mixed with the same amount of blood on a cover glass by the hanging drop method. Tests made with separate extracts of the cephalic glands and of the esophagus showed that the anticoagulin was chiefly contained in the esophagus extract; the extract of the cephalic glands had only a very slight inhibitory effect on the coagulation. A similar difference could be demonstrated when the extracts were made from material which had been previously dried at 37° C. for two days. Saline extracts made of *Spirocerca sanguinolenta*, *Physaloptera clausa*, *Dirofilaria immitis*, and *Schistosoma japonicum* had no inhibitory effect on the coagulation of rabbit blood in vitro."

Caseous lymphadenitis investigations, I-III (*Jour. Council Sci. and Indus. Res. [Aust.]*, 6 (1933), No. 2, pp. 111-115).—The contribution is presented in three parts—(1) Infection Experiments, by D. Murnane (pp. 111-113), and (2) Infection Tests with Accumulated Faeces from Shearing Sheds Where

Caseous Lymphadenitis Is Frequent (pp. 113, 114) and (3) Percutaneous Infection of Guinea Pigs and Sheep with Caseous Material from Natural Lesions of Caseous Lymphadenitis (p. 115), both by H. R. Carne.

Studies in tick-borne fever of sheep.—I, Transmission by the tick *Ixodes ricinus*, with a description of the disease produced, J. MACLEOD and W. S. GORDON (*Parasitology*, 25 (1933), No. 2, pp. 273–283, figs. 4).—The authors find that the causative agent of tick-borne fever in Great Britain is transmitted by the adult female and the nymphal stage of the castor-bean tick. The goat was also found to be susceptible to the disease. A discussion of the economic importance of this fever is included.

A comparative morphological study of the infective larvae of the common nematodes parasitic in the alimentary tract of sheep, G. DIKMANS and J. S. ANDREWS (*Amer. Micros. Soc. Trans.*, 52 (1933), No. 1, pp. 1–25, figs. 33).—The species here considered include *Haemonchus contortus*, *Ostertagia circumcincta*, *O. mentulata*, *Trichostrongylus instabilis*, *T. vitrinus*, *Cooperia oncophora*, *C. curticei*, *Monodontus trigonocephalus*, *Nematodirus spathiger*, *Oesophagostomum columbianum*, and *Chabertia ovina*. The details are summarized in tabular form, followed by tables giving comparative measurements of infective larvae made by different authors. A list of 27 references to the literature is included.

Trichostrongylid nematodes from sheep in Kenya, R. DAUBNEY (*Parasitology*, 25 (1933), No. 2, pp. 224–241, figs. 17).—This review of information on the trichostrongylid nematodes from sheep in Kenya includes the description of a new species of *Trichostrongylus* (*T. hamatus*), one of *Cooperioides* (*C. kenyensis*) for which the genus (*Cooperioides*) is erected, and one of *Ostertagia* (*O. pinnata*).

Experimental icterohemorrhagic spirochetosis of the sheep, goat, and pig [trans. title], C. MÉLANIDI, N. TZORTZAKI, and G. DÉBONERA (*Rev. Gén. Méd. Vét.*, 42 (1933), No. 494, pp. 76–82).—The inoculation experiments reported show sheep and goats to be susceptible to the human type of the virus of infectious jaundice or Weil's disease.

Cryptorchidism and its economic importance to the producer of swine and the processor of pork products, J. E. NORDBY (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 6, pp. 901–912, figs. 2).—This contribution from the Idaho Experiment Station is presented in connection with a list of 20 references to the literature.

The data indicate that the loss to the processor of pork products and the annoyance to the producer of cryptorchid pigs is not of much economic importance when the normally descended testis is removed early in life and the pig is taken to market when around 6 or 7 months of age. It is considered probable that the producer would sustain bigger losses by castrating his cryptorchid pigs.

Experimental determination of the protective dose of the swine erysipelas serum for pig [trans. title], P. VIRIDÉN (*Skand. Vet. Tidskr.*, 22 (1932), No. 11, pp. 589–600; *Eng. abs.*, p. 600).—In experimental work the author found that 2 cc of swine erysipelas serum is a sufficiently large dose to protect an animal against infection with swine erysipelas bacilli. Swine erysipelas serum, however, did not always protect an animal against the disease.

The resistance of the eggs and larvae of swine kidney worm, *Stephanurus dentatus* Diesing, with special reference to the control of stephanuriasis, Z. DE JESUS (*Philippine Agr.*, 21 (1933), No. 10, pp. 677–694).—It was found that the eggs of *S. dentatus* lost their vitality after an exposure of 24 hours to a 4 percent solution of crude common salt, and that the larvae were killed after

an exposure of 11 hours to a 3 percent solution. "A 1:10,000 solution of copper sulfate of commercial quality destroyed the vitality of the eggs of *S. dentatus* after an exposure of 24 hours and killed the larvae after an exposure of 20 hours. Using a 4 percent solution of crude common salt or a 1:10,000 solution of copper sulfate in the hog wallow will not only destroy the vitality of the eggs but also kill the larvae."

Effects of low temperatures upon encysted *Trichinella spiralis*, D. L. AUGUSTINE (*Amer. Jour. Hyg.*, 17 (1933), No. 3, pp. 697-710, figs. 2).—In the experimental work here reported the author found that "raw pork loin roasts, in which trichinous muscle had been inserted, were rapidly brought to low temperatures varying from -18.1° to -34.6° C., recorded by means of thermocouples inserted into the trichinous muscle itself. Temperatures as low as -21° produced no demonstrable injury to the parasites, whereas reduced viability resulted from exposure to a temperature of -27.6° . Still greater injury was demonstrated on larvae exposed to -30.9° . Larvae subjected to a temperature of -33.9° produced no infection in test animals although about 12 percent appeared normal microscopically. Complete destruction occurred at -34.6° . Complete destruction was demonstrated on *Trichinella* larvae brought rapidly to a temperature of -18° and there held for 24 hours.

"It can be concluded that raw pork, in commercial quantities, may be rendered safe, as far as trichinosis is concerned, by either rapidly lowering its temperature to -35° or by rapidly lowering its temperature to -18° and holding it for at least 24 hours at that temperature."

Reference is made to the reports of Ransom previously noted (E.S.R., 31, p. 356; 34, p. 680).

***Brucella abortus* infection in fistulous withers and poll-evil of the horse** [trans. title], G. SCHOOP (*Deut. Tierärztl. Wchnschr.*, 40 (1932), No. 33, pp. 520-522).—The blood sera of 3 of 6 cases of fistulous withers and all 3 cases of poll-evil studied reacted to the agglutination test for *B. abortus* at titers of from 1 to 200 to 1 to 2,000. The manner in which infection may be transmitted from the bovine to the horse includes the use in common of grooming implements and stalls and the feeding of raw cow's milk to foals and colts. Vaccination as a supplement to surgical treatment was found to be of value.

***Brucella* Bang infections of the horse** [trans. title], J. VAN DER HOEDEN (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 42 (1932), No. 1-2, pp. 1-39, figs. 14).—The blood sera of 50 of 67 horses affected with fistulous withers, poll-evil, or abscesses of the neck or shoulders reacted positively to the agglutination test with titers of not less than 1:400. The pus from 30 of 48 horses studied was found to contain *B. abortus*. With 3 horses that were fed cultures of *B. abortus* there was a rise in temperature about the third day, the organism being recovered from the blood 6 days later, at which time agglutinins were present. It is pointed out that, as previously noted (E.S.R., 63, p. 371), brucelliasis of the horse is frequently met with in the Netherlands, the bovine type of the organism having been found involved.

Cirrhosis of the liver in horses in connection with feeding with clover hay rich in hybrid clover.—A preliminary communication [trans. title], A. HJÄRRE and B. CARLSTRÖM (*Skand. Vet. Tidskr.*, 23 (1933), No. 1, pp. 12-18; *Eng. abs.*, pp. 17, 18).—In this preliminary contribution the authors describe a form of cirrhosis of the liver in horses, with local extension, which appears to be caused by feeding alsike clover.

Contribution to the knowledge of diphtheroid infections of equines, with special reference to Egypt, M. CARPANO, trans. by E. TALAREWITCH ([*Egypt*] *Min. Agr., Tech. and Sci. Serv. Bul.* 118 (1932), pp. 22, pls. 8).—Part 1

of this contribution deals with ulcerous lymphangitis (pp. 1-17) and part 2 with necrotic dermatitis of equines (pp. 18-22.)

Entropion operation in foals, J. F. BULLARD (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 6, pp. 927, 928).—This contribution from the Indiana Experiment Station describes a modified operation for entropion which is much more easily performed than the regular operation as described in the standard textbooks on surgery.

Equine encephalomyelitis, K. F. MEYER (*North Amer. Vet.*, 14 (1933), No. 6, pp. 30-48).—A summary of information on this disease as it occurs in the United States, including the results of investigations conducted in California in collaboration with C. M. Haring and B. Howitt. Its transmission to man is considered in connection with three case reports.

The particle size of the virus of equine encephalomyelitis, A. P. KRUEGER, B. HOWITT, and V. ZEILOR (*Science*, 77 (1933), No. 1994, pp. 288, 289).—The authors report upon experimental work during the past year and a half on ultrafiltration of suspensions of encephalomyelitis brains. The results, presented in detail in tabular form, show that the "virus traverses a 3 percent membrane but is retained by a 3.5 percent membrane. The usual bacteriological tests for the detection of micro-organisms were applied to the filtrates with negative results. Our data would indicate an approximate particle size of $500\mu\mu$ for the virus as it exists in brain suspensions. Under like conditions of preparation and filtration it is of the same order of magnitude as the causal agent of poliomyelitis, and analogous disease of man, and is apparently 10 times the size of the hoof and mouth disease virus particle. Dilution does not appear to render the virus more finely dispersed, as by elution from carrier particles for example, nor to affect the filter pore surfaces so that the particles pass more readily."

The iron percentage of horse blood, especially in respect to infectious anemia in horses [trans. title], E. LEHNERT and S. SVENSSON (*Skand. Vet. Tidskr.*, 22 (1932), No. 1, pp. 21-25; *Eng. abs.*, p. 25).—The average value of the iron percentage, as determined on 56 healthy regimental horses, amounted to 0.409 g of iron per 1,000 cc of blood, corresponding to 122.8 g of hemoglobin per 1,000 cc of blood.

A contribution to the study of the piroplasmoses in Greece [trans. title], M. STYLIANOPOULOS and B. ANANIADÈS (*Bul. Soc. Path. Exot.*, 25 (1932), No. 8, pp. 889-892; 26 (1933), No. 1, pp. 15-18).—The first part deals with piroplasmosis of the horse due to *Piroplasma caballi* and the second with that due to *Nuttalia equi*.

The protective value of strangles bacterin tested on horses after infection with strangles streptococci [trans. title], T. BLOM (*Skand. Vet. Tidskr.*, 22 (1932), No. 1, pp. 3-18, figs. 4; *Eng. abs.*, pp. 17, 18).—In the author's experimental work the protective value of a strangles bacterin, consisting of strangles streptococci killed by boiling and emulsified in a carbolic salt solution, was neither great nor of long duration when tested against a subsequent fatal infection with the organism. A 15 cc dose of a 0.1 volume percentage of the bacterin was injected subcutaneously.

Susceptibility of bats to infection with the horse trypanosome, *Trypanosoma hippicum* Darling, in Panama, L. H. DUNN (*Jour. Prev. Med.*, 6 (1932), No. 3, pp. 155-160).—The author has succeeded in demonstrating in a number of experiments that bats are readily susceptible to infection with the horse trypanosome, *T. hippicum*, in Panama, a form first described by Darling in 1910 (*E.S.R.*, 23, p. 486).

"Five species of bats were used in the experiments, and positive results were obtained with each species. The incubation periods in the bats that were inoculated intraperitoneally varied from 5 to 72 hours. More than 68 percent of the bats became positive as early as 18 hours after inoculation. The bats that were tube-fed with infected blood became positive in 48 hours. The incubation periods in those fed with infected blood varied from 5 to 9 days. Two of the bats survived for 26 days after being inoculated, this being the maximum period of longevity of the infected bats. Several died 2 or 3 days after becoming positive. The short, fatal course of this equine form of trypanosomiasis in fruit-eating and insect-eating bats indicates that they cannot become very important carriers or reservoirs of the disease in a community. The fact that this trypanosomal infection was successfully passed through the normal mucosa of the alimentary tract in the mouth-feeding experiments makes it highly desirable to apply this method of investigation to the blood-sucking bats that attack horses and mules."

Poultry diseases, including diseases of other domesticated birds, with chapters on the anatomy and physiology of the fowl, B. F. KAUPP (*Chicago: Alexander Eger, 1933, 6. ed., rev. and enl., pp. 444, figs. 168*).—A revised and enlarged edition of the work previously noted (E.S.R., 62, p. 266).

Resistance of chickens to the nematode *Ascaridia lineata* affected by dietary supplements, J. E. ACKERT and T. D. BEACH (*Amer. Micros. Soc. Trans., 52 (1933), No. 1, pp. 51-58*).—Contributing from the Kansas Experiment Station, the authors report experiments on 140 White Leghorn chickens conducted with a view to determining if a plant diet would affect the resistance of chickens to the intestinal nematode *A. lineata* Schneid. An ordinary cereal basal ration containing adequate vitamins and minerals was supplemented with meat meal and skim milk (ad libitum) for group 1 (controls). The chickens of group 2 received the same diet, except for the skim milk which was omitted; the diet for group 3 was the same as that for group 2, except that peanut meal replaced the meat meal as a supplement.

"The chickens of group 1 in each experiment made the best growth, those in group 2 the next best, and the chickens in group 3 the slowest growth. After being on the respective diets for 6 weeks each chicken was given approximately 500 embryonated eggs of *A. lineata*. After 3 weeks all chickens were killed and the nematodes isolated and measured. The criteria for testing the degree of resistance were the numbers and lengths of the *A. lineata* removed from each group of chickens at autopsy. Biometrical treatment of the results showed that the chickens of group 1 were the most resistant to the *A. lineata*, as they had significantly fewer and shorter nematodes than did either of the other groups. No constant differences in numbers of nematodes occurred between groups 2 and 3, but group 2 gave evidence of being more resistant to the growth of the *A. lineata* than did group 3.

"The results indicate that the inclusion of liquid skim milk and meat meal as supplements in the diets increased the growth rates and the resistance in the chickens to the nematode *A. lineata*, but that the plant diet produced the slowest growth rate and the least potent resistance in the chickens to the growth of the *A. lineata*. These results are attributed in part to the wider ranges of amino acids made available in the diets of groups 1 and 2, and to the restricted range of amino acids and the slower digestibility of the plant diet of the chickens of group 3."

Preliminary experiments on the mass treatment of poultry for the roundworm *Ascaridia lineata* Schneider, F. H. S. ROBERTS (*Queensland Agr.*

Jour., 39 (1933), No. 4, pp. 161-163).—The unsatisfactory results obtained from the use of tobacco dust supposed to contain 2 percent nicotine are thought to have been due to the low percentage (0.86 percent) of nicotine present. It was found in using oil of chenopodium that at least three treatments, with 10- to 14-day intervals, are necessary.

Studies on coccidiosis.—IV, Mortality and infection among artificially inoculated chickens, R. L. MAYHEW (*Poultry Sci.*, 12 (1933), No. 3, pp. 206-210).—In this fourth contribution from the Louisiana Experiment Stations (E.S.R., 68, p. 533), based upon work extending over a period of 3 years, the author presents data on the number of deaths and cases of hemorrhage occurring among inoculated chickens during the period of illness from coccidiosis when raised under closely controlled conditions.

“The total number of deaths was 152 out of 671 inoculations of birds, or 22.7 percent. The results are summarized from a series of inoculations made on 47 different dates and extending over a period of about 3 years. The distribution of mortality by days is also given. The largest number of deaths occurred on the sixth day after inoculation, when 65, or 42.7 percent, died. It is believed that the deaths occurring after the eighth day were due largely to other complicating factors, chiefly temperature changes. Details as to these special cases are given. The high percentage of infection without hemorrhage suggests the importance of application of sanitary measures by the flock owner in epidemics of coccidiosis.”

Coccidiosis of the fowl in Russia (U.S.S.R.) [trans. title], W. L. YAKIMOFF and E. F. RASTEGAÏEFF (*Zentbl. Bakt. [etc.]*, *Orig.*, 123 (1931), No. 1-2, pp. 1-14, figs. 4).—Four species of *Eimeria* are recognized as occurring in the fowl in Russia, namely, *E. tenella* and three new forms to which the provisional names *E. beachi*, *E. johnsoni*, and *E. tyzzeri* are given. A list is given of 19 references to the literature.

Experimental studies on *Eimeria avium* [trans. title], S. NOHMI (*Imp. Zootech. Expt. Sta., Chiba, Japan, Bul.* 29 (1932), pp. 3+155, pls. 8, fig. 1; *Eng. abs.*, pp. 147-151).—This is an extended account of studies of the morphology and development of the avian coccidium and the effect of disinfectants upon it. The author found that this form did not develop in the turkey, pigeon, sparrow, or duck.

Observations on the macroscopic diagnosis of fowl paralysis, E. JUNGHER (*Poultry Sci.*, 12 (1933), No. 3, pp. 184-188, figs. 2).—In this contribution from the Connecticut Storrs Experiment Station the author points out that since the etiological factor in this disease is unknown, the only possible manner of diagnosis is through examination of the nervous system by pathological and histopathological methods. Microscopic study is considered the preferable method if it can be carried out, although the gross examination of the sciatic trunk and brachial plexus is serviceable in routine diagnostic work and should be an established procedure.

“The gross examination should be conducted on at least four birds from each suspected lot. Nerve lesions consisting of changes in size and consistency of the nerve tissue are most apt to be found in the dorsal root ganglia of one or the other side of the brachial plexus. A simple method of gross examination of the nerves is described which requires only a limited number of tools and is applicable in the field as well as the laboratory.”

A list is given of 27 references to the literature.

Investigations of the virus of fowl pest, III-VIII [trans. title], R. DOERR ET AL. (*Ztschr. Hyg. u. Infektionskrankh.*, 101 (1923), No. 2, pp. 125-139; 112 (1931), No. 4, pp. 732-753; 113 (1932), No. 4, pp. 645-681; 114 (1932), No. 2,

pp. 269-283).—These continue the series of reports of studies of the fowl pest virus commenced in January 1914,² the second part of which has been noted (E.S.R., 47, p. 181). Part 3 is by Doerr and E. Zdansky (pp. 125-139); part 4 by Doerr, S. Seidenberg, and L. Whitman (pp. 732-753); part 5 by Doerr and E. Gold (pp. 645-670); and parts 6 (pp. 671-681), 7 (pp. 269-275), and 8 (pp. 276-283) by Doerr and Seidenberg.

A chronic carrier of fowl typhoid of turkeys, W. R. HINSHAW and T. J. TAYLOR (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 6, pp. 922-926, fig. 1).—This is a report contributed from the California Experiment Station of a case of ovaritis in a Bourbon Red turkey caused by *Salmonella gallinarum*. "This bird recovered from an acute case of fowl typhoid during the fall of 1930, and reacted to the agglutination test until its death in July 1932, when *S. gallinarum* was isolated from its ovary. This diagnosis furnishes evidence that fowl typhoid may be transmitted through eggs of turkey carrier hens, but as no cultures of the organism were obtained from the 17 eggs laid by the bird positive proof was not secured."

Leucemia in the fowl, L. R. RICHARDSON (*Vet. Alumni Quart. [Ohio State Univ.]*, 21 (1933), No. 1, pp. 24-33).—Examinations made of 250 birds resulted in the finding of 10 infected with lymphatic leukemia, the study of which is here reported.

"Gross lesions showed the liver and spleen to be enlarged and studded with grayish-white areas, accompanied in some cases by an enlargement of the kidneys and nodules along the intestines. The intestines in every case showed severe catarrhal enteritis, and in some parasites were found. Microscopical examination revealed the alteration of these organs to be due to a hyperplasia of the lymphoid tissue normally found in the various organs. Microscopical examination of the intestines showed severe catarrhal enteritis with extensive desquamation of the epithelium covering the villi. The nerves examined in these cases were found to be free of lymphoid infiltration. The examination of the blood showed no pathological change.

"It is thought from the study of this disease that catarrhal enteritis with extensive desquamation of the epithelium covering the villi is the primary lesion, with subsequent absorption of toxins from the digestive tract, causing a hyperplasia of the lymphoid tissue normally found in the various organs."

The pathology of spontaneous leukosis of chickens, W. H. FELDMAN and C. OLSON, JR. (*Jour. Amer. Vet. Med. Assoc.*, 82 (1933), No. 6, pp. 875-900, figs. 7).—This is a report of the authors' studies presented in connection with a review of the literature, of which a list of 23 references is included. It is pointed out that while the affection can be transmitted experimentally the question of communication from affected to healthy chickens has not been settled.

The piroplasmiasis of fowls in Greece [trans. title], G. DÉBONÉRA (*Bul. Soc. Path. Exot.*, 26 (1933), No. 1, pp. 14, 15).—An enzootic disease of fowls met with in the summer of 1932 in the vicinity of Athens was found to be due to *Aegyptianella pullorum*, first recorded by Carpano in Egypt (E.S.R., 62, p. 566).

Pseudo poultry plague: The second outbreak, R. N. JOHNSTONE (*Jour. Dept. Agr. Victoria*, 31 (1933), No. 2, pp. 80-83, figs. 4).—The author here discusses pseudo-poultry plague or Newcastle disease of poultry, which has appeared for the second time in Victoria, the first outbreak having occurred in December 1930. It is pointed out that in 1926 it appeared in Java and spread with such rapidity that during 1926 and 1927 about 5,000,000 head of poultry

² Doerr, R., and Pick, R. *Centbl. Bakt. [etc.]*, 1. Abt., Orig., 76 (1915), No. 7, pp. 476-494.

died of the disease in that island; practically speaking it exterminated all the poultry.

Salmonella aertrycke infection in chicks, S. H. GAIGER and G. O. DAVIES (*Vet. Rec.*, 13 (1933), No. 23, pp. 538, 539).—This is an account of an outbreak of *S. aertrycke* on a farm in southern England, where the infection was introduced with the hatching eggs received.

The domestic fowl of Uganda as a host for trypanosomes of the brucei group, H. L. DUKE (*Parasitology*, 25 (1933), No. 2, pp. 171–191).—In the experimental work here reported the author has found that “the domestic fowl of Uganda is susceptible to infection with *Trypanosoma rhodesiense* and with *T. brucei* by the bite of *Glossina palpalis* or *G. morsitans*. A fowl so infected with *T. rhodesiense* can infect clean *G. palpalis* fed upon it, but apparently only with very great difficulty. In theory, therefore, the fowl may play a part in the spread of *T. rhodesiense* in nature.”

The occurrence of bacteria in eggs, F. ANDRESEN (*Über das Vorkommen von Bakterien in Eiern. Inaug. Diss., Tierärztl. Hochsch., Berlin, 1932, pp. 41+III*).—In bacterial examinations made of 586 eggs secured from 14 different sources 43 were found to contain bacteria, *Bacterium pullorum* having been detected in 13. It is concluded that eggs from flocks kept under proper sanitary conditions are largely free from bacterial infection. A review of the literature is presented in connection with a list of 45 references.

Anatomy and pathology of the spontaneous diseases of the smaller laboratory animals, edited by R. JAFFÉ (*Anatomie und Pathologie der Spontanerkrankungen der Kleinen Laboratoriumstiere (Kaninchen, Meerschweinchen, Ratte, Maus). Berlin: Julius Springer, 1931, pp. XIX+832, figs. 270*).—In the preparation of this work the editor was assisted by 28 associates. The work includes classified lists of references to the literature of each subject.

Distemper in the mink, R. N. SHAW (*Vet. Rec.*, 13 (1933), No. 22, pp. 513–517, figs. 2).—In experimental work in Massachusetts with distemper, a highly contagious disease of the mink as well as of the cat, dog, and ferret, adult minks were found to show a considerable amount of resistance, while kits were very nearly if not quite 100 percent susceptible.

The course of the disease, following the injection of virus, including the incubative period, is from 10 to 16 days. In all cases, the bacteriological examination failed to show any specific pathogens, and autopsies were also negative. These facts are both characteristic of a filtrable virus disease and check perfectly in every respect with canine distemper. Hemologous anti-canine distemper serum injection is very effective as a preventive and control measure. It produces a passive immunity which lasts no more than 3 weeks. The serum, as treatment in clinical cases, is worthless.

AGRICULTURAL ENGINEERING

Surface water supply of the United States, 1931, Part 8 (*U.S. Geol. Survey, Water-Supply Paper 718 (1933), pp. V+135, fig. 1*).—This report, prepared in cooperation with the State of Texas, presents the measurements of flow made on streams in the western Gulf of Mexico Basins during the year ended September 30, 1931.

[**Pump irrigation studies at the North Platte Substation**] (*Nebraska Sta. Rpt. [1932], p. 37*).—Progress results are briefly reported.

Nebraska tractor tests, 1920–1932 (*Nebraska Sta. Bul. 277 (1933), pp. 31, fig. 1*).—This bulletin summarizes the results of 74 tractor tests and includes data on all tractors reported by their manufacturers as on the market January 1, 1933 (*E.S.R.*, 65, p. 676).

Tractor fuels, E. C. SAUVE (*Michigan Sta. Quart. Bul.*, 15 (1933), No. 4, pp. 287-292).—Results of tests of different tractor fuels are briefly summarized.

Results show that gasoline is the most volatile of the petroleum fuels and contains the greatest number of heat units per pound as compared with other fuels. The value of gasoline depends upon the nature of its distillation, and more power will be produced in an engine using a low-test gasoline than a high-test gasoline. It was also found that the power or efficiency of an engine is not necessarily in direct ratio to the B.t.u. of the fuel used. It was found that kerosene and distillate are satisfactory fuels for tractor use when tractors are designed to accommodate them. The investigations seem to indicate that the use of crude oil for tractor fuel is of questionable economy. The most economical fuel for tractor use based on performance and cost was found to be distillate, followed in order by kerosene, gasoline, and alcohol-gasoline blends.

The quality of wheat as affected by farm storage, C. O. SWANSON and F. C. FENTON (*Kansas Sta. Tech. Bul.* 33 (1932), pp. 70, figs. 27).—The results are reported of a study of the quality of wheat and the methods of preventing damage while in storage, conducted by the departments of agricultural engineering and milling industry of the station.

It has been found that damage to the quality of combined wheat results from storing with a sufficient moisture content to cause heating, which is usually accompanied by molding. Too much moisture in wheat may result from combining too early, from immature wheat in low spots in the field, or from rain or dew. Excessive heating is more likely to take place if the temperature of the wheat is abnormally high when it is placed in the bin. Continued hot weather soon after storing also promotes heating of the wheat. It has been found that heat diffuses slowly in wheat, and that hot pockets may develop from loads of high-moisture or high-temperature wheat. Small amounts of damp wheat are less likely to be damaged if mixed and stored with dry wheat. Natural respiration in normally dry wheat brings about an improvement in the baking value of the flour. However, if the moisture content is too high, a lowering of the milling and baking value takes place.

The storage studies showed that the type of material used in bin construction is of less importance in preventing damage to the wheat than the type of ventilation used in the bin. Ventilation to be effective must cause enough air movement to cool the wheat and remove excess moisture. A type of ventilator which does not accomplish this promotes damage rather than prevents it, because it tends to condense moisture and brings in enough oxygen to support mold growth. Of the natural methods of ventilation tried, that which permits the passing of the air upward through a perforated floor gave the best results. Another effective method of natural ventilation was by means of perforated side walls and a large perforated central flue with a suction cupola on top. It was also found that heating wheat may be cooled and lowered in moisture content by transferring from one bin to another.

In experiments conducted during 1931 it was found that forced ventilation was more effective in cooling the wheat than natural ventilation. While the evidence comparing suction of air with forcing of air was limited, the indications were that forcing was more effective than suction. It was also found that the temperature of wheat stored in ventilated bins approximated the outside air temperatures more closely than that stored in unventilated bins.

Wind electric lighting plants, E. G. McKIBBEN and J. B. DAVIDSON (*Iowa Sta. Bul.* 297 (1933), pp. 261-275, figs. 7).—This is a summary of investigations made to determine the possibilities and limitations of the wind electric plant under Iowa farm conditions. It is based on the results obtained from sev-

eral years' investigations and one year's operation, under test, of a wind electric plant located at the station and from a study of the performance of 66 wind electric plants on Iowa farms.

It has been found that where properly installed, equipped, and managed, wind electric plants on Iowa farms are satisfactorily supplying electricity for lighting and small household appliances. During a year's trial at the station a wind electric plant produced 842 kw.-hr. and during 10 months of the year the monthly energy production was over 50 kw.-hr. During September, however, it was only 31.2 and during August, 11.3 kw.-hr.

It appears that the tower should be from 10 to 25 ft. higher than surrounding buildings or trees, although the exact tower height is said to be still a matter of judgment rather than mathematical calculation. Unless the plant is very lightly loaded, at least a 240-a.-hr. battery will be needed, and under many conditions a 300- to 400-a.-hr. battery will be more satisfactory.

The advantages of this type of lighting plant over an engine-driven plant are enumerated as (1) no fuel cost; (2) almost no routine attention; and (3) absence of noise, vibration, grease, and odors. The disadvantages are (1) higher first cost, (2) limitation of generator output by the wind available, (3) maintenance of a larger battery, and (4) the necessity of occasionally climbing the tower.

The conclusion is that any development which would decrease the first cost of the plant, decrease the cost per unit of storage capacity of the batteries, or increase the useful life of the batteries, would materially improve the economic position of the wind electric plant.

Electric steam sterilization and water heating in the dairy ([C.R.E.A.] *Natl. Rural Elect. Proj., College Park, Md., Rpt. 7 (1933), pp. 40, figs. 51*).—This publication presents practical information on the use of electricity for heating purposes in dairies and on the selection of sterilizing and water-heating equipment best suited to different farm conditions and electric rate structures. Such equipment is described, and its characteristics, adaptability, and approximate cost are stated briefly.

The results of tests of a controlled steam sterilizer and of bacterial reduction in steam sterilizers are reported. It was found that scalding, boiler steam sterilization, and controlled steam sterilization were approximately equal in effectiveness in reducing bacterial counts under carefully controlled conditions.

Electric soil sterilization, A. V. KREWATCH and G. W. KABLE ([C.R.E.A.] *Natl. Rural Elect. Proj., College Park, Md., Rpt. M-15 (1933), pp. 12, figs. 6*).—The results of studies of the practicability of the resistance method of soil heating conducted by the National Rural Electric Project in cooperation with the Maryland Experiment Station are reported.

In general the conclusion is drawn that the resistance method may be used with reasonable safety and satisfaction for sterilizing soils in a specially built sterilizing box. It may also be used in bench soils where conditions are uniform and the operator has acquired the technic for his particular conditions.

The equipment necessary for sterilizing in benches or beds consists of sheet metal plates to be used as electrodes, 2-wire cable, clips for connecting the cable to the plates, and a reliable glass thermometer. The plates are inserted vertically in the soil across the bed at regular intervals, and each successive plate is connected to opposite sides of a 230-v circuit. The size of plates is determined by the width and depth of the soil in the bench, and the number and spacing by the capacity of the circuit, the moisture, and the soil type.

The power demand varied widely with different types of soils, soil moisture content, soluble salts in the soil, and increasing temperature during steriliza-

tion. Contact resistance between soil and plates tended to accelerate heating at the plates, drying the soil and stopping the flow of current. Current leakage from the plates to the ground in grounded beds stimulated drying at the plates and made sterilization almost impossible without cutting transformer and service grounds.

A cover made of a double thickness of black mulch paper placed over one half of the bench resulted in an increase of temperature of 10° F. in the body of the soil, 66° in surface soil, and 36° at the edge of the bench. In the uncovered section the temperatures started dropping before the surface and edge temperatures reached 180°.

The power necessary for sterilization in a ground bed with the electrical ground disconnected was greater than in benches, the range being between 40 and 50 kw.-hr. per cubic yard in comparison with from 30 to 40 kw.-hr. per cubic yard in the bench, or from 25 to 30 kw.-hr. in the box sterilizer. Under the best conditions the sterilization of ground beds, in addition to using more power, was less satisfactory than soil in benches because of the longer heating period with the accompanying drying at the plates.

A three-row nursery planter for space and drill planting, O. A. VOGEL (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 6, pp. 426-428, fig. 1).—In a contribution from the U.S.D.A. Bureau of Plant Industry, a 3-row nursery planter is described and illustrated which will sow one or three rows as desired and space-plant wheat kernels at various intervals or drill them at various rates. A feature of the planter is that it will seed to the last few kernels and that nearly as many rows of wheat can be planted as drilled within a given period.

The combine harvester in Georgia, H. E. LACY and W. A. MINOR, JR. (*Ga. Agr. Col. Bul.* 428 (1933), pp. 28, figs. 13).—Results of a survey of 24 combines in Georgia are reported. These have been used successfully for harvesting wheat, oats, rye, and soybeans in the State. It has been found that the losses are about one half as much as for the binder-thresher method, these being about 3 percent for the combine and 6 percent for the binder-thresher. The estimated life of the combine in Georgia is 9.4 years. Green weeds tended to choke the combine and add moisture to the threshed grain.

The study indicates that in Georgia the farmer should have from 100 to 150 acres of small grain in order to justify a 10- or 12-ft. combine. The per acre cost of harvesting was found to decrease as the acreage harvested increased, the cost being \$2.02 when 200 acres per machine is harvested, \$1.47 when from 200 to 400 acres are harvested, and \$0.82 when more than 400 acres are harvested. The average cost of harvesting with the combine in the 24 cases studied was \$1.79 per acre as compared with \$3.04 for a mule binder.

Stationary spray plants in Georgia, T. J. HARROLD and H. E. LACY (*Ga. Agr. Col. Bul.* 429 (1933), pp. 28, figs. 11).—The information reported in this bulletin was developed from studies conducted at the college and from data secured from 13 orchards to determine what contribution the proper utilization of stationary spraying equipment and machinery might make to efficient and profitable orchard production. From this information engineering data are presented on the planning, installation, and use of stationary spraying plants.

Movable hog houses, W. C. SKELLEY and E. R. GROSS (*New Jersey Stas. Circ.* 276 (1933), pp. 4, figs. 2).—Practical information is given on the planning and construction of movable hog houses, together with working drawings and bills of materials.

The housing of poultry, I. RHYS ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul.* 56 (1933), pp. V+36, pls. 8, figs. 40).—This is the third edition of this bulletin (E.S.R., 57, p. 882).

Ventilation of dairy barns in Quebec, L. G. HEIMPEL (*Sci. Agr.*, 13 (1933), No. 8, pp. 528-539, figs. 4).—This is a practical contribution on the subject presented in connection with a list of 10 references to the literature.

Corncribs for the Corn Belt, M. A. R. KELLEY (*U.S. Dept. Agr., Farmers' Bul.* 1701 (1933), pp. II+26, figs. 33).—This presents designs for several types of grain storages adapted to the Corn Belt.

Insulation on the farm (Washington: U.S. Dept. Com., Natl. Com. Wood Util., 1933, pp. VI+49, figs. 44).—This is a report of the subcommittee on insulation on the farm of the National Committee on Wood Utilization. Its purpose is to point out to farmers how to select the proper type of insulating material for any particular requirement and how to install it to the best advantage.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics at the Michigan Station] (*Michigan Sta. Quart. Bul.*, 15 (1933), No. 4, pp. 227-238, fig. 1).—In a study entitled Trends in the Use of Farm Lands in the Upper Peninsula (pp. 227-231), by E. B. Hill, tables are presented and discussed showing, by counties, the percentage of land in farms and the number of farms, acres per farm, and tillable acres per farm at the time of different Federal censuses. The trends in the agriculture of the section are discussed.

Cost of Producing Michigan Beans in 1932 (pp. 231-234) is discussed by P. F. Aylesworth with tables showing for the years 1929-32 the costs, by items, of growing and harvesting, the yields, man, horse, and tractor hours used per acre, etc., and for 1932 the costs per acre of man labor, seed, manure, fertilizer, and growing cost on farms in different size groups on Miami and Brookston soils.

Potato costs in Michigan in 1932 (pp. 234-238) is discussed by K. T. Wright with tables showing (1) for farms in the northern, western, and eastern sections of the State for seed and table potatoes and also for seed potatoes in the Upper Peninsula the cost per acre, by items, of growing and harvesting, the yields, man, horse, and tractor hours, amounts of seed, fertilizer, and manure used, and other items, and (2) the effect of yield on costs.

[Investigations in agricultural economics at the Ohio Station], J. I. FALCONER (*Ohio Sta. Bimo. Bul.* 162 (1933), pp. 91, 92).—Included is a table with discussion showing, by years 1920-32, the quantities of wheat, bacon, ham, and shoulders, lard, and tobacco exported from the United States. The table of index numbers of production, prices, and income is brought down through February 1933 (E.S.R., 69, p. 128).

[Investigations in agricultural economics] (*Jour. Farm Econ.*, 15 (1933), No. 2, pp. 388-403).—Notes are included on the following investigations and subjects: Collegiate Mathematics Needed in the Social Sciences, a report prepared for the Social Science Research Council, by H. R. Tolley et al. (pp. 388-395); Comparative Cost of Food at Farm and City Prices, by A. Cripps and E. L. Kirkpatrick (pp. 395-397); Marketing Attitudes of Large-Scale Wheat Producers of Kansas, by J. H. Coolidge (pp. 397-400); Proportion of Production Areas of High and Low Yield, by W. C. Waite and R. W. Cox (pp. 400-402); and The Struggle Against the Agricultural Crisis in Czechoslovakia, by S. Borodaewsky (p. 403).

American agricultural policy; P. C. CAMPBELL (London: P. S. King & Son, 1933, pp. XVII+304, figs. 2).—The author presents results of a 2-year study of American agricultural policy, made under a Rockefeller International Fellowship.

In the five chapters composing the book, the American farm, public aid to agriculture, regulating production, and marketing policy are treated. In an appendix, the author presents summaries of the Federal agricultural outlook for the years 1927 to 1931, inclusive.

Proceedings of land use symposium [of the American Association for the Advancement of Science] (*Syracuse: N.Y. State Col. Forestry, Syracuse Univ., [1932], pp. 57, pl. 1*).—Included are the following papers presented at the meeting held at Syracuse, N.Y., June 21, 1932: The National Land Use Committees, by L. C. Gray (pp. 5-8); The Relation of Taxation to Land Utilization, by F. P. Weaver (pp. 9-14); Land Use and Forestry, by J. S. Illick (pp. 15-24); The Tax Problem, by M. Graves (pp. 25, 26); Land Use and Agriculture, by J. G. Lipman (pp. 27-36); Land Use and Erosion, by H. G. Knight (pp. 37-43); Land Use and Transportation, by C. L. Raper (pp. 44-47); and Planned Land Use, by L. R. Schoenmann (pp. 48-57).

Proceedings of the First Missouri Conference on Land Utilization, edited by C. H. HAMMAR and H. H. KRUSEKOPF (*Missouri Sta. Bul. 323 (1933), pp. 62*).—Included are the following papers presented at the conference held at the College of Agriculture of the University of Missouri, on February 23 and 24, 1933: Recent Economic Changes and Their Effect on American Agriculture, by N. A. Olsen (pp. 5-15); Land Inventory and the Problem of Marginal Lands, by M. F. Miller (pp. 16-21); Urban and Rural Interest in the Back-to-the-Land Movement, by E. L. Morgan (pp. 21-26); Forestry Possibilities in Missouri, by F. Dunlap (pp. 27-30); Foreclosed Land and the Farm Debt Problem, by O. R. Johnson (pp. 31-34); Synthesizing a State Land Policy, by F. D. Farrell (pp. 35, 36); History of Levees and Drainage in Southeast Missouri, by S. P. Reynolds (pp. 37-44); Drainage Problems of Grand River Bottoms, by H. K. Johnson (pp. 45, 46); The Extent and Causes of Drainage Tax Delinquency, by W. A. Oliver (pp. 47-52); The Investor's Stake and His Attitude, by W. K. Bliss (pp. 53, 54); Critical Elements of a Program of Adjustment in Southeast Missouri, by W. W. Martin (pp. 55-58); and The Human Element in a Conservation Program, by W. Burr (pp. 59-62).

The public domain of Nevada and factors affecting its use, E. O. WOOTON (*U.S. Dept. Agr., Tech. Bul. 301 (1932), pp. 52, figs. 4, maps 2*).—With a view to making a study of the factors affecting the present and potential uses of range land in a public land State, Nevada was selected for a detailed study to determine the conditions peculiar to the State and different parts of the State that must be considered in an attempt to solve the range problem. While most of the data are for the year 1926, some are included for 1929. No material changes have occurred to date in the major factors discussed.

Surface relief, climate, erosion, plant cover, forage resources, and water supply are described. The tenure and use of land and water, the historical and legal factors affecting such tenure and use, the development of the livestock industry, and the claims of stockmen are discussed.

[Land problems and agrarian reforms in different countries of Europe and Africa] (*[Internatl. Rev. Agr., Mo. Bul. Agr. Econ. and Sociol. [Roma], 22 (1931), Nos. 3, pp. 67-108, figs. 6; 11, pp. 341-354; 12, pp. 369-382; 23 (1932), Nos. 3, pp. 65-73; 5, pp. 119-135; 6, pp. 155-168; 8, pp. 249-262; 9, pp. 274-285; 24 (1933), No. 4, pp. 113-130*).—This is a series of articles discussing in general the land systems and agrarian problems prior to the World War, the legislation since the war, and the changes and results under such legislation. The several articles are as follows: The Agrarian Reform in Rumania, by E. Petrini (v. 22, pp. 67-108); Agrarian Reform in Hungary, I, II, by K. Ihrig (v. 22, pp. 341-354,

369-382); Land Tenure Problems in East Africa (v. 23, pp. 65-73); The Agrarian Reform in Estonia from 1919 to 1930 (v. 23, pp. 119-135, 155-168, 249-262); Rural Settlement in Post-war Germany, by H. Böker (v. 23, pp. 274-285); and Agrarian Reform in Spain, by E. Martinez de Bujanda (v. 24, pp. 113-130).

Agricultural systems of middle Europe: A symposium, edited by O. S. MORGAN (*New York: Macmillan Co., 1933, pp. XIX+405, figs. 10*).—This volume is designed as a source book for agriculturists, economists, politicians, and other students of economic and social phenomena, and for collateral reading in college courses devoted to the study of national, agricultural, economic, and political policies. The subjects included in the outline submitted to the several contributors included physical factors; population; land utilization; a brief history of agriculture, 1918-31; land reform; production and technics; marketing and marketing program; agricultural cooperation of various sorts and sizes; taxation, insurance; agricultural education; farmers in politics—farmers' unions or societies; farmers' income; outlook for agriculture and farmers; special economic developments; Pan-Europa, etc.; and bibliography and statistical tables.

Included besides the editor's introductory chapter are the following chapters by ministers of agriculture or other high officials of the several countries: The Austrian Agrarian Policy, by L. Hennem and A. Steden; Bulgarian Agriculture, by J. S. Molloff; Czechoslovak Agriculture, by V. Brdlík; The Agricultural Policy of Greece, by G. Servakis and C. Pertountzi; Agriculture and the Agricultural Economic Policy of Hungary, by I. E. Nagy; Polish Agriculture, by V. Leśniewski and W. Ponikowski; Aspects of Rumanian Agriculture, by A. Frundianescu and G. Ionescu-Sisesti; and The Economic Position and Future of the Agriculture of Yugoslavia, by V. N. Stoykovitch.

Agrarian reform before post-war European constituent assemblies, V. A. MOODY (*Agr. Hist.*, 7 (1933), No. 2, pp. 81-95).—This is a brief description of the movements and legislation prior to the World War.

The agricultural crisis in 1930-31, G. PAVLOVSKY ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol. [Roma]*, 23 (1932), No. 1, pp. 1-20).—This article briefly surveys "the main features in the recent phase of the world crisis in agriculture, the factors by which the course of this crisis is being determined, and the tendencies that appear to stand out from the examination of the facts and figures."

The course of the agricultural depression in 1931-32, G. PAVLOVSKY ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol. [Roma]*, 24 (1933), No. 1, pp. 1-41).—The structural background of the depression, the financial crisis and the world market, and agricultural conditions in 1931-32 are discussed.

Present conditions of the management of privately owned forests in Europe, G. LUNCZ ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Sci. and Pract. [Roma]*, 24 (1933), Nos. 3, pp. 120-129; 4, pp. 163-172).—A brief summation is made, by countries, of the more important legislation and regulations in force.

Scientific organisation of agricultural work in Finland, K. T. JUTILA and P. EKKO ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol. [Roma]*, 23 (1932), No. 8, pp. 219-249, figs. 3).—This history of the investigations relating to labor in Finland and the Association for Rationalization of Agricultural Work and some of the results reached by the association are discussed.

Collective agreements in agriculture (*Internatl. Labor Off., Geneva, Studies and Rpts., Ser. K, No. 11* (1933), pp. 122).—The organization, history, and scope of collective bargaining in agriculture are described, and the contents of the items contained in the agreements regarding hours of work, holidays, housing,

work of women and children, and social insurance, the permanent character of such items, and the question as to what extent such bargaining replaces inadequate social legislation are discussed.

Group and chain farming in the United States, January 1930–March 1933, with some references to group farming in foreign countries, compiled by E. M. COLVIN (*U.S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog.* 46 (1933), pp. I+28+[4]).—This mimeographed bibliography, which supplements the references to group and chain farming prior to 1930, previously noted (*E.S.R.*, 63, p. 84), includes 62 annotated references to commercial farm management services in the several States of the United States and in Puerto Rico and 38 references to foreign countries. References to community, co-operative, and collective farming have been omitted.

The agricultural emergency in Iowa, VII–X (*Iowa Sta. Circs.* 145 (1933), pp. 105–135, figs. 2; 146, pp. 137–156, figs. 2; 147, pp. 157–179, figs. 6; 148, pp. 181–211, figs. 2).—These circulars continue the series previously noted (*E.S.R.*, 69, p. 131). Part 7, Monetary Inflation, by G. Shepherd and W. Wright, traces "what consequences may be expected to follow from certain actions" in monetary expansion; part 8, How Tariffs Affect Farm Prices, by T. W. Schultz, discusses how different tariff policies would affect the Iowa farmer; part 9, Farm Mortgage Foreclosures, by W. G. Murray and R. C. Bentley, analyzes farm mortgage foreclosure data, particularly for the period 1921–32, and discusses proposed solutions for the situation; and part 10, Shrink Agriculture or Shift Tariff Protected Industries, by Schultz, discusses the consequences of tariff adjustment as a means of restoring the foreign trade of the United States.

Farm relief and the domestic allotment plan, M. L. WILSON (*Minneapolis: Univ. Minn. Press*, 1933, pp. 59, figs. 3).—This lecture is the first of three in a series entitled *Proposals for Economy Recovery*. It is discussed briefly by O. B. Jesness.

The farm debt problem (*U.S. House Represent., 73d Cong., 1st Sess., Doc.* 9 (1933), pp. VII+54, figs. 10).—This is a letter from the Secretary of Agriculture "transmitting in response to House Resolution No. 69 a report based on the study made by the Bureau of Agricultural Economics of the Department of Agriculture pertaining to farm mortgage debts and the refinancing thereof." Information is given as to the amount of farm mortgage indebtedness and the interest obligation; farm real estate values; farm taxes; farm mortgage foreclosures and tax sales; sources of, interest rates on, and term and methods of repayment of farm mortgage loans; the relation of mortgage indebtedness to real estate values; the proportion of all farms with heavy indebtedness; time required to pay off farm mortgages; and interest and tax charges against mortgaged farms and their relation to farm income. The relations of different credit agencies to the debt problem and some methods for readjusting farm mortgage debt are discussed, and some suggestions are made as to adjusting and refinancing farm mortgages.

The data in general are shown and discussed by States or geographic divisions and by years for periods of different lengths.

Some aspects of the farm mortgage situation in South Dakota and their relation to a future land use policy, S. E. JOHNSON and H. A. STEELE (*South Dakota Sta. Circ.* 9 (1933), pp. 63, figs. 29).—Facts and figures regarding the development of the present farm mortgage situation in South Dakota are brought together from reports of the 1930 Federal census, records of county registers of deeds and State departments, and reports of and correspondence with lending institutions.

Tables, maps, and charts are included and discussed presenting, usually by counties, the data as to the percentage of farms mortgaged, tenancy, mortgage indebtedness per acre, interest rates, farm prices, land values, farm income, voluntary and forced sales of land, and foreclosures. The experience of different lending agencies as regards volume of loans, delinquent loans, foreclosures, and real estate owned is analyzed.

The concentration of land ownership and its probable relation to a future land-use policy, the problems arising from concentration of land ownership, and some of the factors to be considered in formulating a policy for the disposal of distressed lands are discussed.

Ten years of Federal intermediate credits, F. BAIRD and C. L. BENNER (*Washington, D.C.: Brookings Inst., 1933, pp. XVI+416, figs. 9*).—Part 1 discusses the origin and character of the Agricultural Credits Act of 1923 and the structure of the intermediate credit system. Part 2 includes chapters on the intermediate credit system and the commercial banks, agricultural credit corporations for the livestock industry, administration of livestock loans, agricultural credit corporations and crop production loans, administration of crop production loans, loans to cooperative marketing associations, other loan services for cooperatives, and financing the Federal intermediate credit banks. Part 3 deals with the prospects of the rural credit system in chapters on changing conditions and emerging issues, the intermediate credit banks and the Federal Farm Board, and the place of the intermediate credit banks in our financial structure.

Appendixes include a table showing, by years, the distribution of earnings of the Federal intermediate credit banks and a copy of the loan application used.

State measures for the relief of agricultural indebtedness in the United States, 1932 and 1933, compiled by L. O. BERCAW, M. T. OLCOTT, and M. F. CARPENTER (*U.S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 45 (1933), pp. 64+[4]*).—Included are references by States to legislation enacted—the more important sections being given where the laws were available—and to bills proposed but not enacted.

Farm management programme of the Colonization Finance Corporation [of Canada Limited], F. W. REINOEHL (*Sci. Agr., 13 (1933), No. 8, pp. 481-488*).—The plans and principles of the Colonization Finance Corporation, a corporation controlled by nine loan companies and organized for group farm management of family farms, are described.

The International Agricultural Mortgage Credit Company: General scope and organization, G. COSTANZO (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 22 (1931), No. 12, pp. 382-392*).—The conditions leading up to the organization of the credit company and the objects, organization, operation, and management of the company are described.

The American transportation problem, H. G. MOULTON ET AL. (*Washington, D.C.: Brookings Inst., 1933, pp. LXIX+915, pls. 3, figs. 37*).—This is an analysis of the problem prepared for the National Transportation Committee. Part 1 includes a summary of American transportation development. Part 2 discusses factors affecting railway net income; part 3, financial structure and financial policies; part 4, the regulation of the level of rates; part 5, water transportation, including a chapter on waterway history and policy and other chapters analyzing the comparative cost of water and rail transportation and specific waterway projects; part 6, highway transportation, including the nature of the highway transport problem, highway development and financing costs, motor vehicle taxation, truck competition in agricultural products, and the possibilities of coordination of rail and motor transport; part 7, other

transportation agencies; part 8, the stabilization of the railroad industry; and part 9, reorientation in transportation regulation, including chapters on the development of the present system of regulation and the need for a new transportation policy. The report of the National Transportation Committee, including the report and conclusions of the committee and the supplemental report of A. E. Smith, is given.

Barley survey, H. C. GRANT ([*Gt. Brit.*] *Empire Marketing Bd.* [Pub.] 62 (1933), pp. 196, pls. 8, figs. 32).—This is “a study of barley production, exports, imports, marketing, markets, and prices in the principal exporting and importing countries in the world.”

Farm prices of cotton related to its grade and staple length in Georgia, seasons 1929–30 and 1930–31, L. D. HOWELL and W. T. FULLILOVE (*Georgia Sta. Bul.* 174 (1933), pp. 37, figs. 4).—This study was made in cooperation with the Bureau of Agricultural Economics, U.S.D.A., to determine the variations in prices paid in the same local market for the same grades and staple lengths of cotton and whether the average local market prices vary with the average grades and staple lengths sold, to compare the variations of local market prices with the premiums and discounts in central markets and the fluctuations of central market prices, and to examine the relationship between seasonal variations in price and in average grade and staple length. Data were collected from 10,664 bales sold in 12 local markets in 1929–30 and 8,492 bales sold in 11 markets in 1930–31. Much of the material is in the form of tables and charts.

Prices in local markets varied so irregularly that in the same market on the same day some farmers received more for the lower grades and shorter staples than others for the higher grades and longer staples. Average premiums in local markets for grades above middling were only 32 percent of those in central markets. Average discounts in local markets were 117 percent of those in central markets in 1929–30 and 74 percent in 1930–31. In the local markets average premiums for the higher grades and longer staples and the average discounts for the lower grades were small compared with the variations in the price for cotton of the same grade and staple length on the same days. The average discount in the local markets for staples less than $\frac{7}{8}$ in. was only 0.04 c. per pound, while in the central markets the discount for $\frac{1}{8}$ -in. staple was 0.91 c. The premium for staples over $\frac{7}{8}$ in. in local markets was only about 18 percent of that in central markets. Staple premiums and discounts averaged higher in the local markets in mill-buyer markets than in those where other types of buyers predominated, but the differences in many cases were less than the differences that existed in different mill-buyer local markets. Average prices were somewhat higher in markets in communities where higher grades and longer staple lengths were grown. The spread between prices in local and central markets was least during the months when local sales were relatively large.

Cotton variety tests in the State have shown that the value per acre of varieties with staple lengths over 1 in. is greater at some stations, even if no premium for length is received, and would be greater at other stations if central market premiums and discounts were applied. Differences of classification, in the character of cotton, in the bargaining power of farmers and buyers, the small quantities of some grades and staple lengths, and the risks of price fluctuations are the main factors causing irregularity of prices received by growers.

The failure of farmers to receive prices reflecting differences in yarn value in the different grades and staple lengths has resulted in the production of the lower grades and shorter staple lengths.

Adjustments in production and improvements in marketing practices recommended are (1) the perfecting of the marketing system so that a greater proportion of the differences in spinning value will be reflected in local prices, (2) more accurate information for farmers regarding the relative profitability of producing cotton of different grades and staple lengths in each community, (3) local classification of each bale according to uniform standards by disinterested, competent, and reliable classifiers, (4) production of cotton of more uniform quality in each community, and (5) adequate information to farmers as to the prices in central markets and nearby points of concentration.

Cotton industry and trade in China, I, II, H. D. FONG (*Nankai Inst. Econ., Indus. Ser., Bul. 4* (1932), vols. 1, pp. XXIV+356, figs. 52; 2, pp. 116).—The several chapters of volume 1 describe and discuss the development and localization of the industry; the production, consumption, price movements, international trade in and marketing methods for raw cotton; the marketing and price movements of manufactured cotton; the extent and character of labor used; labor organizations and legislation and welfare work; the technical and financial size of mills; hand loom weaving; imports and exports of cotton goods; and the prospects for the industry. Volume 2 includes the statistical appendixes.

The flaxseed market and the tariff, R. R. RENNE (*Montana Sta. Bul. 272* (1933), pp. 71, figs. 18).—Data are included as to the production of flaxseed in the leading countries of the world and the United States. Consumption of flaxseed in the United States and the marketing of such seed are described. The competitive situation of the flaxseed industry is discussed, including descriptions and data as to tariffs, trends of imports, organization of the flaxseed-crushing industry of the United States, transportation costs, marketing practices of United States farmers, drawbacks from exports of flaxseed products, and oil content of domestic and imported seed. The price differential and equilibrium methods of measuring price effects of the flaxseed duty are discussed, and analysis is made of the effects of the 1922, 1929, and 1930 tariff acts on United States prices and production and trade in flaxseed using (1) Minneapolis and Winnipeg prices, (2) prices paid to farmers in northeastern Montana and southern Saskatchewan, and (3) the equilibrium method. The effects of the 1921, 1922, 1929, and 1930 tariff acts on production of and trade in flaxseed and the general outlook for the next few years are discussed.

Multiple correlation analysis of the combined effect of seven factors upon the differential of adjusted Minneapolis above adjusted Winnipeg flaxseed prices, 1923–28 (a period of a 40 c. per bushel tariff), gave a coefficient (corrected for number of observations) of 0.9689 and the following coefficients of determination: Receipts of flaxseed at Minneapolis in thousands of bushels —0.2149, receipts of flax at Fort Williams and Port Arthur in thousands of bushels 0.1207, stocks of flaxseed in store at Duluth and Minneapolis in thousands of bushels 0.0321, Canadian visible supply of flaxseed in thousands of bushels 1.2651, amount of building operations in the United States in millions of square feet of contracts awarded 0.2579, amount of building operations in Canada in millions of dollars (deflated) of contracts awarded —0.2954, and Argentine visible supply of flaxseed in hundreds of thousands of bushels —0.2216. Minneapolis prices during the period averaged 35.8 c. per bushel above Winnipeg prices. From May 1929 to June 1930 with a 56-c. tariff the differential averaged 43 c. per bushel.

The study of farm prices in Montana and Saskatchewan and the freight rates showed that the tariff increased prices at Flaxville, Mont., 29.8 c. during the period 1923–28, and 30.32 and 31.05 c., respectively, at Scobey and White-tail, Mont., during the period 1924–28. For the period June 1929 to May 1930, inclusive, the increase was 40.14 c. at Flaxville, 29.3 c. at Scobey, and 30.6 c.

at Whitetail, Mont. The equilibrium method indicated that the removal of the 40-c. tariff during 1923-28 would have lowered the price of flaxseed in the United States approximately 30 c. per bushel.

Findings of the study were: (1) The present 65 c. per bushel tariff is not prohibitive and only increases the prices paid farmers about 50 c. per bushel but results in about \$10,000,000 increase in the annual income of North Dakota, Minnesota, South Dakota, and Montana farmers; (2) the fact that the tariff is only approximately 75 percent effective is due largely to the drawback and difference in oil content of domestic and imported flaxseed; (3) approximately 94 percent of the fluctuations of the price differential between Minneapolis and Winnipeg is due to the seven factors considered, of which Canadian visible supply is most important; and (4) the amount of building operations in Canada, the amount of building operations of the United States, the Argentine visible supply, and the receipts at Minneapolis all appeared to exert an appreciable influence on the differential in prices.

Probable effects of a duty on Philippine sugar, R. I. NOWELL (*Jour. Farm Econ.*, 14 (1932), No. 4, pp. 599-604).—The probable effects of a United States tariff on Philippine sugar and of a limitation on imports of such sugar into the United States are discussed. The author states: "It thus appears that producers of sugar in the continental United States would stand to gain but little by having Congress place a tariff on imports of Philippine sugar. Perhaps, however, such action would induce Cuba to make her preferential duty price-effective. It is possible that under the stress of the depression Cuba might be driven temporarily, as evidenced by the recent Presidential decrees, to use its already established export monopoly to raise prices irrespective of the influence of this on Philippine production. In that event a tariff on Philippine sugar would have a negligible effect on sugar prices in the United States but would represent welcomed protection for the Cubans."

An economic study of the agriculture of the Connecticut Valley.—V, Factors affecting the prices and acreages of cigar tobacco in the United States, H. B. BOYD (*Connecticut Storrs Sta. Bul.* 180 (1932), pp. 221-292, figs. 28).—This bulletin, prepared in cooperation with the U.S.D.A. Bureau of Agricultural Economics, is the fifth of the series previously noted (*E.S.R.*, 67, p. 180) and reports the results of a study the purpose of which was to examine the possibility of determining the causes of variations in the prices for cigar tobacco.

Correlation analyses are made of the effect on the farm prices, 1922-29, of Connecticut Valley Broadleaf (U.S. type 51), Connecticut Valley Havana Seed (U.S. type 52), southern Wisconsin (U.S. type 54), northern Wisconsin (U.S. type 55), Wisconsin (U.S. types 54 and 55), Pennsylvania (U.S. types 41 and 53), and Miami Valley (U.S. types 42, 43, and 44) of such factors as the October 1 supply of the type, the percentage of stemming tobacco in the crop, the number of revenue stamps sold during the preceding year for the classes of domestic cigars for which the type of tobacco is used, the October 1 supply of competing types, the deviations from trends in supply and sale of revenue stamps, the disappearance of supply, etc. Other correlation analyses are made of the changes in acreage of Connecticut Valley Broadleaf and Connecticut Valley Havana Seed with such factors as the average price for the type for the two years preceding deflated by the index of farm wages and fertilizer prices, the acreage planted the preceding year, and the average percentage that Broadleaf price was of Havana Seed price during the two preceding years, and of the changes in acreage of Wisconsin tobacco with the deflated prices of such tobacco the preceding year and the second preceding year and the change in the acreage the preceding year.

About one fourth of the price variability of Connecticut Valley Broadleaf tobacco was attributable to the supply of that type. About one half of the variability for the other binder types was determined by the changes in the respective supplies. Deviations of supply from the trend of supply caused about one third of the price variability of the Pennsylvania types and nearly one half for the Miami Valley types. Percentage of stemming tobacco in the crop accounted for about one half of the price variability for Connecticut Valley Broadleaf and Havana Seed and northern Wisconsin tobacco and about 29 percent for southern Wisconsin tobacco. Changes in the supply of northern Wisconsin tobacco caused 1.5 percent of the price variability of Connecticut Valley Havana Seed tobacco. Changes in the supply of other binder types caused about one fifth of the price variability of northern and southern Wisconsin tobacco. No relation was found in the case of the other types studied.

Sales of revenue stamps for certain classes of domestic cigars were related to the price for each type studied, but in the case of the binder types it was difficult to judge the effect. The deviations from the trend in the output of classes A, B, and C domestic cigars accounted for 54.8 percent of the variability in the price of Pennsylvania tobacco and 20.3 percent in the case of Miami Valley tobacco. Supplies 10 percent above the average for the period resulted in decreases in prices of 5 percent for Connecticut Valley Broadleaf, 7 percent for Connecticut Havana Seed, 7 percent for southern Wisconsin, and 4 percent for northern Wisconsin tobacco. A 20 percent increase in supplies resulted in decreases of 8, 11, and 8 percent, respectively, in the prices for the first three types. A 10 percent decrease in supply caused increases in prices of 7, 16, 18, and 12 percent, respectively, and a decrease of 20 percent caused increases of 18, 35, 53, and 35 percent, respectively. An increase of 10 percent from the average percentage of stemming tobacco resulted in decreases in prices of 6, 5, 12, and 4 percent, respectively. A 10 percent increase in the supply of Connecticut Valley Havana Seed tobacco reduced the price of northern Wisconsin tobacco 4 percent, while a 10 percent increase in the northern Wisconsin supply reduced the price of Connecticut Valley Havana Seed 9 percent. The price of southern Wisconsin tobacco increased 9 percent when the combined supply of Connecticut Valley Havana Seed and northern Wisconsin tobacco decreased 10 percent.

A 10 percent change in the sales of stamps for classes B and C domestic cigars was accompanied by a 10 percent price change for Connecticut Valley Broadleaf and 9 percent for Connecticut Valley Havana Seed tobacco (8 and 9 percent, respectively, with sales measured by deviations from trend). A 10 percent change in the sales of stamps for A and B classes of cigars was associated with changes in price of 8 percent for southern Wisconsin and 12 percent for northern Wisconsin tobacco. A 10 percent deviation from trend in stamp sales for A, B, and C domestic cigars was accompanied by 70 percent price changes in Pennsylvania tobacco and 67 percent in Miami Valley tobacco. The annual decrease in Connecticut Valley Broadleaf price was 5 percent, in Connecticut Valley Havana Seed tobacco 4 percent, and in Pennsylvania tobacco 5 percent.

Of the variability in the acreage changes, 41.4 percent of those for Connecticut Valley Havana Seed and 55.2 percent for Connecticut Valley Broadleaf tobacco were attributable to the average price, respectively, of the two types during the two preceding years. In the case of Broadleaf tobacco, the acreage planted the preceding year was almost as important as the price factor. In the case of Connecticut Valley Havana Seed tobacco, 16.8 percent of the variability was attributable to the acreage of Havana Seed and Con-

necticut Valley shade-grown tobacco the preceding year. In the analysis of the Wisconsin acreage, the indexes of determination were 0.760 for the preceding year's price and 0.318 for the price the second preceding year.

The percentages of increase in acreage from the average for the period with prices 10, 20, and 30 percent above the average for the period were for Connecticut Valley Broadleaf 10, 19, and 23; Connecticut Valley Havana Seed 4, 6, and 7; Wisconsin one year later 12, 20, and 24; and Wisconsin two years later 6, 10, and 14. The decreases with prices 10, 20, and 30 percent below the average were for Connecticut Valley Broadleaf 16, 45, and no record; Connecticut Valley Havana Seed 5, 15, and 39; Wisconsin one year later 10, 16, and 20; and Wisconsin two years later 7, 14, and 18.

World wheat crops, 1885-1932: New series, with areas and yields, by countries, M. K. BENNETT (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 9 (1933), No. 7, pp. [1]+239-274, figs. 3*).—This is a new series, with areas and yields, by countries. Wheat production, acreage, and yield per acre are presented for 40 countries annually from 1919 to 1932, and for 39 countries from 1885 to 1918. Previous tabulations showed "world" production but not acreage and yield per acre. Moreover, they do not apply to identical land areas in pre-war and post-war years and they cover fewer years. In contrast, this study provides students with detailed data for individual countries.

The process of adjusting available official statistics or of filling in gaps by direct estimates is described in some detail.

The data given show that between 1885-89 and 1927-31, in the world excluding U.S.S.R., the increase in wheat production was due 78 percent to increase of acreage and 22 percent to increase of yield.

The durum wheat situation (*Winnipeg: United Grain Growers Ltd., 1932, pp. 19, figs. 2*).—This is a review of the production and marketing conditions in the several producing countries.

Potential supply areas of Pacific coast markets for hogs, E. A. DUDDY and D. A. REVZAN (*Jour. Farm Econ., 14 (1932), No. 4, pp. 586-598, figs. 2*).—This article deals with the potential supply areas for and the breaking points in the potential competition between the Portland, Oreg., market and the Sioux City, Iowa, and St. Paul, Minn., markets, and between the Los Angeles, Calif., market and the Omaha, Nebr., Kansas City, Mo., Fort Worth, Tex., and Pittsburgh, Pa., markets.

"It seems conclusive from the study thus far that during the period studied the west coast markets were not able to penetrate the areas of intensive hog production of the Middle West in competition with Missouri River or eastern markets. Such supplies as moved west were mostly reshipments from other markets rather than from country points. To an increasing degree this movement seems to be on a direct-to-packer basis as is evidenced by the decline in total hog receipts reported at the Los Angeles stockyards since 1928."

An economic survey of range sheep production in western Canada, L. E. KINDT (*Ottawa: Canada Dept. Agr., Agr. Econ. Branch and Expt. Farms Branch, 1933, pp. [2]+42+[3], figs. 17*).—This preliminary report analyzes the financial transactions and other details involved in the management and operation of 125 sheep ranches in 1926 in the Provinces of Alberta, Saskatchewan, and British Columbia. The production in the three Provinces, including the use and control of land, rate of stocking, herding systems, lamb crop, weights of lambs and fleece, death losses, capital invested, indebtedness, ranch receipts, expenses and income, and size of business unit are discussed. The land, aged ewe, and breeding and marketing problems of Alberta and Saskatchewan are also discussed.

The Australian wool industry: Report by the Commonwealth Wool Inquiry Committee (*Canberra: Govt., 1932, pp. XVIII+84, figs. 9*).—This report of the committee appointed by the Prime Minister of the Commonwealth includes its findings and recommendations as to wool production in different countries, wool prices, costs of production and marketing, the trends in different items of cost since pre-war years, reductions in different items of costs, land taxes, the organization for marketing the Australian wool clip, and sterling exchange. The general problems of and a national policy for the industry are discussed and recommendations made.

Animal industry in the British Empire, A. N. DUCKHAM (*London: Humphrey Milford, Oxford Univ. Press, 1932, pp. [XVII]+239, pl. 1, figs. 17*).—This is a brief review of the significance, methods, problems, and potentialities of the livestock and dairying industries of the British Commonwealth.

The British Agricultural Marketing Act, H. J. WADLEIGH (*Jour. Farm Econ., 14 (1932), No. 4, pp. 558-573*).—The provisions of the British Agricultural Marketing Act of 1931 are described and some comparisons made with the Agricultural Marketing Act of 1929 of the United States.

Report on the marketing of potatoes in Scotland (*Edinburgh: Dept. Agr. Scotland, 1933, pp. 154, figs. 5*).—The volume of production, location of growing areas, Scottish, English, and foreign demand, competing supplies, fluctuations in demand and prices, distribution by rail and sea and by seasons, etc., are analyzed. The organization of the trade, including the different methods of marketing and the organization of distribution in different areas and centers and by different agencies, prices and the effects of different factors on prices, and wholesale and retail price margins are discussed.

Futures trading with particular reference to agricultural commodities, A. G. PETERSON (*Agr. Hist., 7 (1933), No. 2, pp. 68-80*).—A brief history is given of futures trading and legislation relating thereto.

Marketing hay by modern methods, G. A. COLLIER (*U.S. Dept. Agr., Farmers' Bul. 1700 (1933), pp. II+26, figs. 15*).—This bulletin supersedes Farmers' Bulletin 1265 (E.S.R., 47, p. 693).

Agricultural insurance in Canada ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol. [Roma], 23 (1932), No. 7, pp. 198-206*).—The legislation and activities in connection with hail and livestock insurance are discussed.

[**Agricultural cooperation**] ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol. [Roma], 22 (1931), Nos. 4, pp. 117-128; 5, pp. 143-153; 6, pp. 184-193; 9, pp. 293-306; 10, pp. 309-325; 23 (1932), Nos. 2, pp. 31-42; 3, pp. 55-65; 4, pp. 107-113; 5, pp. 135-149; 7, pp. 210-214; 9, p. 300; 12, pp. 392-398; 24 (1933), Nos. 2, pp. 45-56; 3, pp. 73-86*).—This is a series of articles discussing in general the development and present status of cooperation in the production, processing, and marketing of agricultural products, in rural credit, purchase of agricultural requirements, etc., and in some cases cooperation among consumers. The countries dealt with and the contributors are as follows: Hungary, by K. Ihrig (v. 22, pp. 117-128); Czechoslovakia, by O. Šaseci (v. 22, pp. 143-153, 184-193); Finland (v. 22, pp. 293-306, 309-325); Norway, by H. Lindstedt (v. 23, pp. 31-37, 55-65); Spain (v. 23, pp. 37-42); Mexico (v. 23, pp. 107-113, 300); Argentina, by E. Ferrari (v. 23, pp. 135-149, 210-214); Bulgaria, by Y. Kojoukharoff (v. 23, pp. 392-394); Chile (v. 23, pp. 394-398); and Poland, by Z. Ludkiewicz (v. 24, pp. 45-56, 73-86).

Keeping and using farm records, J. A. HOPKINS, JR. (*Ann Arbor, Mich.: Edwards Bros., 1932, pp. IX+203, figs. 21*).—"The central purpose of this book is to develop practical applications of accounts and records in the management of the farm." Part 1 deals with the farm budget, farm production records, the inventory, and the net worth statement; part 2 with farm bookkeeping; part

3 with the analysis, interpretation, and use of the income statements, quarterly and financial summaries, year's records, and efficiency factors; part 4 with some special problems in farm accounting, such as multiple column and single entry records, perennial crops, and personal, outside investment, partnership, and orchard accounts; part 5 with the valuation of different assets and methods of calculating depreciation; and part 6 with the keeping and use of feed and labor records, the analysis of enterprises, and the use of accounting data in budgetary control.

Numerous forms for records are included and their use explained and illustrated. Most of the chapters include questions and lists of collateral readings.

Analysis of variance as an effective method of handling the time element in certain economic statistics, T. W. SCHULTZ and G. W. SNEDECOR (*Jour. Amer. Statis. Assoc.*, 28 (1933), No. 181, pp. 14-30).—This is a contribution from the Iowa Experiment Station. It illustrates the application of Fisher's analysis of variance technic (*E.S.R.*, 50, p. 234) in meeting the usual problems concerning the seasonal and secular changes in time series in a study of the geographical distribution of prices paid producers of swine in Iowa, October 1924 to September 1931, inclusive.

The economic findings of the study were (1) that the prices paid producers were roughly 25 c. for 100 lb. higher in the southeastern part of the State than in other parts, and (2) that the price differentials between districts showed a very definite seasonal movement, being fairly constant from October through June and then widened materially during the summer and early fall months. The authors summarize the advantages of the analysis of variance technic as follows:

"(1) It affords a strict mathematical procedure by which a great bulk of complex data may be readily reduced to a few summary expressions, i.e., the mean squares in the analysis of variance table; (2) the arithmetic required to reduce the data first to sums of squares and then to mean squares is materially simplified compared with more common methods; (3) it is in harmony with the theory of small samples first established by 'Student'—the adjustment made by using the appropriate number of degrees of freedom; (4) the method provides an exact test of significance in the z distribution developed by R. A. Fisher; and (5) it is the only efficient technic by which it is possible to isolate the heterogeneity and interpret the significance of a number of components simultaneously."

Statistics based upon data for farm accountancy for 1927-28 [trans. title] (*Inst. Internatl. Agr. [Roma], Comptab. Agr. Rec. Statis. 1927-28*, pp. [4]+XXXI+412, figs. 9).—This is the first of a proposed series on this subject. It covers France, England, Netherlands, Germany, Denmark, Sweden, Norway, Switzerland, Austria, Czechoslovakia, Hungary, Rumania, Poland, Latvia, Estonia, and Finland. An introductory chapter discusses the methods used in the several countries, the difficulties encountered, the results obtained, and the limitations to which all the conclusions are subject. A list in 12 languages is included of the principal terms used in farm accountancy. Tables showing the accountancy office and system used in each country; and the location, date, area covered, and other information as to the studies and maps of the countries are included. Two sets of tables are given, one for peasant farms and one for large farms. Each set includes tables showing for each system of operation the utilization of land, the areas of different crops grown, capital invested in agriculture for different purposes, wages paid, value of products consumed by the families, the production of different kinds of grain and livestock, quantities of products sold and prices received, receipts, expenses, expense properly chargeable to production, gross returns, total and per part of products

marketed, costs of production by chief items, returns on capital invested, the social income, and the general averages for all farms.

Some results of the comparative statistical study of farm accountancy data in certain countries for 1927-28, J. DESLARZES ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [Roma], 22 (1931), Nos. 6, pp. 161-178; 7, pp. 212-228, figs. 3; 8, pp. 237-251, figs. 4; 9, pp. 269-284, figs. 4; 10, pp. 325-337, figs. 5).—This monograph was prepared "to state the reasons which have induced the Institute to undertake the comparative statistical study of the results of farm accountancy in the different countries, as well as to indicate not merely the positive results obtained but also the difficulties encountered in the course of the inquiries, the lacunae that it has not been possible to fill, and the lines of improvement which appear to be indicated." It analyzes the figures in the publication noted above and presents a survey of the results and the possibilities offered by the systematic development of such work.

Farm accountancy statistics for 1928-29 [trans. title] (*Inst. Internatl. Agr.* [Roma], *Comptab. Agr. Rec. Statis.* 1928-29, pp. CIV+278, figs. 13).—This is a continuation of the series noted above. The tables and notes are given in both French and English.

Provisional results of farm accountancy for 1929-30 ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [Roma], 23 (1932), No. 9, pp. 267-274).—Provisional results for 1929-30 of the study made by the International Institute of Agriculture are compared with those for 1927-28 and 1928-29 noted above.

Production of crops and livestock on the Newlands project in 1932, F. B. HEADLEY and C. VENSTROM (*Nevada Sta. Bul.* 130 (1933), pp. 7, figs. 2).—The agricultural census reports of the U.S. Bureau of Reclamation are compiled and compared with similar reports for previous years or groups of years (E.S.R., 67, p. 471).

Crops and Markets, [May 1933] (U.S. Dept. Agr., *Crops and Markets*, 10 (1933), No. 5, pp. 153-192, figs. 3).—Included are reports, tables, charts, etc., of the usual types covering crop and livestock estimates, market reports on different farm products, cold storage holdings, prices, and farm real estate values.

World production of and world trade in table grapes, K. RITTER and M. GUTTFELD ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [Roma], 23 (1932), Nos. 9, pp. 285-299; 10, pp. 303-316; 11, pp. 339-349; 12, pp. 373-382; 24 (1933), No. 2, pp. 57-69).—The consumption, international trade of different districts, and the post-war developments in production and trade are described, and the production and international trade of the leading importing and exporting countries are discussed.

Cold-storage holdings (U.S. Dept. Agr., *Statis. Bul.* 39 (1933), pp. 36, fig. 1).—The information in the bulletin previously noted (E.S.R., 65, p. 784) is brought up to December 31, 1931.

RURAL SOCIOLOGY

Research in farm family living: Scope and method, edited by J. D. BLACK (*Social Sci. Res. Council Bul.* 11 (1933), pp. [6]+209).—This is the eleventh of the series of reports on scope and method in the several subfields of agricultural economics and rural sociology. It represents the joint efforts of some 17 specialists experienced in rural social science research.

Farm family living as a field of research is defined, and basic concepts and measures are stated by J. D. Black and C. C. Zimmerman. A statement concerning the historical development of research in this subfield is made by the latter. A useful bibliography is appended to the preliminary material.

Illustrative projects, presented for purposes of analysis, are divided into six groups. Group A deals with individual items in farm family living, illustrated by 18 projects and 37 subprojects; B, aggregate family living, 8 projects; C, comparisons between areas or social groups, 5 projects; D, the effect of community factors, 4 projects; E, merchandising relations, 3 projects; and F, general and miscellaneous, 8 projects.

The report is designed as an aid to specialists and administrative officers in choosing projects, methods, and procedures.

Farm family living in Wisconsin, E. L. KIRKPATRICK, P. E. McNALL, and M. L. COWLES (*Wisconsin Sta. Res. Bul. 114* (1933), pp. 48, fig. 1; *Sup.*, pp. 18).—This is a study of income and certain other factors influencing the living of some 900 farm families in the six type-of-farming areas of the State, made in cooperation with the U.S.D.A. Bureau of Agricultural Economics by the combined family living and farm management survey.

The conclusions drawn indicate the use of about \$1,450 worth of goods and services for family living for the year 1929-30. Of this amount, \$500 worth is furnished by the farm and \$950 worth is purchased. For the year of the study family living and net cash family income are not strikingly related. The value of the operator's equity in the farm resources and the cost of living are as closely associated as net cash income and the cost of living. Tenure status or experience of the family has little bearing on the cost of living.

The size of the family and ages of the sons and daughters at home are fairly closely related to the cost of living but unrelated to net cash income.

The formal schooling of the operator and the homemaker is partially indicative of the cost of living. Participation in organization activities and the cost of living are practically unassociated, as are church attendance and the cost of living.

Cost of living and the selected activities included in the study varied by specific groups of families within localities, and by localities as well as by type-of-farming areas.

Tables given in a multigraphed supplement show (1) by areas studied the average cash receipts, expenditures, net cash income, and accumulation or deficit; average cost of living distributed among the principal goods and services, and between goods and services furnished by the farm and purchased in relation to number of cows kept per farm; composition of families and households; participation in certain activities; and size of house and percentage of homes having certain modern conveniences; (2) cost of living and distribution of total cost among principal goods and services in relation to net cash income, value of operator's equity in farm resources, different costs of living groups, number and ages of children per family, years of schooling of operators and homemakers, reading and radio auditing index, and affiliation of family in local organizations; and (3) coefficients of partial and multiple correlation for different variables for 156 and 900 families in selected localities of Wisconsin.

Housing conditions in relation to farm labor turnover: A study of 1,090 farm houses in five counties in Maryland, M. COFFIN (*Maryland Sta. Bul. 341* (1932), pp. 371-411, pl. 1).—This is a study of housing conditions in relation to the length of tenure of farm laborers. The study showed that housing conditions on Maryland farms are on the average quite satisfactory and the standard relatively good, but that there is a small percentage very poor and far below the standard that should be maintained if good farmers and good farm labor are to be attracted and held on the farm.

Tenant houses occupied the average length of time or longer ranked higher in desirable conditions and conveniences than those occupied less than average time. The data indicated that the more permanent types of houses, with fire-

proof or resistant roofs, and basements, porches, and modern conveniences which add to the comfort of the home, and with attractive yards, induce a longer farm tenure or a greater permanency of the farm population. Farm houses situated on hard-surfaced roads were occupied for longer periods than those on dirt roads. Farm houses less than 3 miles from seven social agencies were occupied longer than those over 3 miles from these agencies. Hired men's houses were occupied one fourth and tenant houses one third as long as farm houses occupied by their owners.

The character of farm housing influences the permanency of tenure, farm profits, and the contentment of the farm population.

A study of certain economic factors in relation to social life among Oklahoma cotton farmers, O. D. DUNCAN and J. T. SANDERS (*Oklahoma Sta. Bul. 211 (1933), pp. 36, fig. 1*).—This is an inquiry into the question of how the economic status of various classes of cotton farmers in Oklahoma is related to their social behavior. The conclusions drawn are as follows:

Cotton farming in Oklahoma is closely related to a high percentage of non-owner farmers. Rural social problems are intimately tied up with the cotton situation. Increased consumption of material goods is usually accompanied by a greater utilization of the nonmaterial. The greatest single obstacle to an improved standard of living is the high cost of running the farm in proportion to the total gross income received from the farm. Due largely to the economic mobility of farmers in passing from low-tenure levels to a higher status, the general law of overpopulation by the lower classes is not verified except by a very small proportion of the population, most of whom are the inert and chronically low-tenure groups. Factors tending to raise the standard of living probably also tend to delay marriages within the farm family. The marriage age of males seems to be more affected by economic and cultural factors than that of females. Church membership of farmers varies directly with tenure and economic status. A positive correlation exists between the amount of education a farmer has received and his economic and social status. Shifts from farming to urban occupations are closely related to economic or cultural conditions, with the shifting probably made easier by increases in economic status and education.

Social activities of the families in the Unionville district, Chester County, Pennsylvania, W. V. DENNIS (*Pennsylvania Sta. Bul. 286 (1933), pp. 24, figs. 8*).—This study of social contacts in one of the older rural areas of the State is a continuation of the study of the social life of farm youth previously reported (*E.S.R.*, 65, p. 887).

The total population of the four townships studied declined from 3,885 in 1850 to 3,206 in 1920, and thereafter increased to 3,582 in 1930. Almost 95 per cent of the population of the area were native born Americans. The majority of the farm owners, however, were not born in the community. Nearly two thirds of the farms had changed hands in less than one generation. Of the 596 families included in the study, 493 reported the presence of children. Farm tenant families averaged 4 children, while owners and laborers averaged 3.8.

College education played a very small part in the life of the community. Twenty-eight fathers and 13 mothers were college graduates. Of these, only 1 mother and 4 fathers were graduates of an agricultural college. Though farm owners liberally provided college education for their children, emphasis was placed on academic and professional careers rather than agricultural.

Both organizational and nonorganizational contacts of adults and of children from 5 to 21 years of age were reported. Owing to the accessibility of urban centers, a large proportion of the social contacts of both adults and young

people were made outside the community. The church was the one institution that included any considerable number of the people; but its influence, as indicated by church and Sunday-school attendance of the youth, was very limited. The major institutions of the community were supported by a small percentage of the population, drawn mostly from the families of farm owners and those of the retired and professional classes. Adults and youth in the tenant and laborer classes shared little in the social life of the community.

The community's consolidated school, located in Unionville, with its excellent equipment and corps of teachers, possesses great potentialities for meeting community needs and shaping ideals.

FOODS—HUMAN NUTRITION

Tenderness of meat.—II, Determination of period of aging grade A beef required to produce a tender quick-frozen product, D. K. TRESSLER and W. T. MURRAY (*Indus. and Engin. Chem.*, 24 (1932), No. 8, pp. 890–892, figs. 3).—Certain modifications in the technic for determining tenderness in meat by both the perforating or cutting gage and the penetrometer described in the previous paper (*E.S.R.*, 68, p. 272) are outlined, and data obtained by the penetrometer method are given on the effects of aging and frozen storage on the tenderness of sirloin steaks.

During storage from 2 to 8 days at from 1° to 3° C., there was a steady increase in tenderness for the first 7 days and a less pronounced increase on the eighth day. The steaks which had aged 5 or 6 days had a better flavor on cooking than those aged for longer periods. Comparisons of the relative tenderness of unfrozen steaks aged for varying periods of time with that of adjacent steaks similarly aged, then quick-frozen, stored at –18° for 3 months, thawed, and tested showed that quick freezing after a short aging period, such as from 3 to 5 days, increased the tenderness of the steak to a marked degree, but that after a longer aging period (e.g., 8 days) the tendering action was less marked. Cooking tests on both fresh and quick-frozen steaks showed equal juiciness when aged for the same period at from 1° to 3° and better flavor for both unfrozen and quick-frozen samples after aging for from 4 to 5 days at from 1° to 3° than after longer aging.

Possibilities and limitations in canning orange juice, M. A. JOSLYN and C. L. MARSH (*Food Indus.*, 5 (1933), No. 5, pp. 172, 173, fig. 1).—A brief summary is given of present knowledge concerning the nature of the changes occurring in orange juice on standing and after canning and of methods which have been used with more or less success in preventing such deterioration. It is admitted, however, that "the ideal juice—one to which nothing has been added, from which nothing has been abstracted, and in which nothing has been destroyed—is yet to be prepared."

A list of 10 references to the literature is appended.

Iron loss in cooking broccoli, M. G. FLANLEY and E. M. JOHNSON (*Jour. Home Econ.*, 24 (1932), No. 9, pp. 821–823).—In the studies reported, the following method of cooking the broccoli was adopted as most satisfactory from the standpoint of texture, flavor, and color: The individual pieces of broccoli, the stems of which were about 7 in. in length and from $\frac{3}{8}$ to 1 in. in diameter, were trimmed at the stalk end to 6½ in. total length, tied in a bunch, put in boiling water (1 qt. with 1 teaspoonful of salt per 100 g. of broccoli), and cooked for 6 minutes with stalks immersed in the water and buds protruding. The entire bunch was then immersed and the cooking continued without a cover for 14 minutes longer. The broccoli was then drained for 1 minute in a colander,

and both broccoli and cooking water were used for iron determinations by the method of Stugart (notes on page 493), with slight modifications.

The average iron values for three determinations each were raw broccoli 0.001064, cooked broccoli 0.000525, and cooking water 0.000542 percent. These indicate a loss in cooking for the short time employed of 50.9 percent of the total iron.

Mineral metabolism—copper and iron, S. W. KLETZIEN, K. W. BUCHWALD, and L. HUDSON (*Soc. Expt. Biol. and Med. Proc.*, 30 (1933), No. 5, pp. 645–647).—This preliminary report deals with the influence of large amounts of copper sulfate on the magnitude of iron assimilation by various tissues of rats. Three feeding series were run involving 62 animals, of which 32 served as controls and the others received the same diet supplemented with the copper sulfate. The iron intake for all averaged 2 mg per rat per day during the 12-week period. The copper intake of the controls averaged 0.033 mg, and of the experimental animals 5.43 mg per rat per day.

The liver, bones, brain, heart, kidney, lung, muscle, spleen, and testicle of the animals on the high copper diet showed small but distinct and consistent increases in iron content over the controls. The liver of the copper-fed animals showed a very marked increase, the kidney a considerable increase, and the spleen a decided decrease in copper content. The iron values are thought to point to a better utilization of iron by the tissues in the presence of copper.

Protein used by pre-school children, I, II, H. MCKAY and E. K. EVANS (*Ohio Sta. Bimo, Bul.* 162 (1930), pp. 80–90, figs. 2).—Part 1 consists of a review and discussion of the literature on the protein consumption and requirement of children, and part 2 of a study conducted by the authors of the food intake and protein content of the diet of 8 normal preschool children, from 19 months to 3 years of age at the beginning of the study, for 1 week during January 1932 and of all but 1 of these children during March of the same year.

The average daily protein intake per person for the entire group was 38.7 g in January and 41.2 g in March. The values for the boys were 42 and 43 and for the girls 36 and 40 g, respectively. When calculated per kilogram of body weight, these values became 2.76 and 2.84 g for the entire group, 2.87 and 2.78 for the boys, and 2.64 and 2.88 g for the girls in January and March, respectively. In terms of body height, the corresponding values were 1.09 and 1.14 for the entire group, 1.17 and 1.15 for the boys, and 1.02 and 1.13 g for the girls.

The range of total protein intake for individual children was from 30.4 to 43.8 g daily in January and 32.4 to 49.3 g in March. The intake of individual children also varied considerably from day to day. The smallest difference in any one child was 12.2 g and the largest 22.1 g. Attention is called to these differences as indicating that a child's food intake must be determined for a considerable length of time to obtain reliable averages.

The percentages of total protein derived from each of the principal food groups during the January and March periods, respectively, were as follows: Milk 50.4 and 53.3, cereals 21.2 and 16.9, vegetables 6.8 and 6.7, fruit 2.4 and 2.7, meat and eggs 18.7 and 19.8, and fatty foods 0.6 and 0.6 percent. Of the total calories, an average of 12.8 percent was derived from protein in January and 13.4 percent in March.

“From the limited data of this study, it would seem that a protein intake of 2.48 to 3.30 g per kilogram of body weight is consistent with good physical development in preschool children.”

Glucuronic acid as a growth factor in guinea pigs, C. O. MILLER, A. E. SIEHRS, and F. G. BRAZDA (*Soc. Expt. Biol. and Med. Proc.*, 30 (1933), No. 5, pp. 636–638).—Data are presented showing that glucuronic acid postponed the

loss of weight in guinea pigs on a vitamin C-deficient diet and hastened the recovery of weight following the administration of orange juice, but did not prevent the onset of scurvy or alter its severity.

It is noted that the adrenals of guinea pigs which had died of scurvy did not reduce a silver nitrate solution.

Metabolism of d- and l-methionine, R. W. JACKSON and R. J. BLOCK (*Soc. Expt. Biol. and Med. Proc.*, 30 (1933), No. 5, pp. 587, 588).—This preliminary report supplements the authors' previous studies on the role of methionine in the animal organism by results obtained in tests of several optically active forms of the protein. Growth of rats on a cystine-methionine deficient diet was stimulated by *d*-methionine and formyl *l*-methionine but not by formyl *d*-methionine.

Availability of vitamins in plant tissues, J. E. RICHARDSON and H. L. MAYFIELD (*Science*, 76 (1932), No. 1978, pp. 498-500).—This contribution from the Montana Experiment Station discusses alterations observed in the potency of vitamins A, B, and C in plant tissues (carrots and potatoes) resulting from cooking, canning, and storage from the standpoint of the structural changes in the cytoplasm of the plant cells in which the vitamins are located.

Recent advances in the knowledge of vitamin A, N. S. CAPPER (*Jour. State Med.*, 41 (1933), No. 3, pp. 175-179).—A brief review of recent literature.

Nutrition studies of foodstuffs used in the Puerto Rican dietary.—V, The vitamin A contents of arracacha, eggplant, squash, chayote, pigeonpea, chickpea, string beans, mamey, redpepper, boiled green plantain, okra, and cassava [trans. title], J. H. AXTMAYER and D. H. COOK (*Puerto Rico Jour. Pub. Health and Trop. Med.*, 8 (1933), No. 4, pp. 407-412; *Eng. abs.*, p. 412).—In this continuation of the series noted previously (E.S.R., 68, p. 708) vitamin A values in Sherman units per gram of edible portion are reported for various native foodstuffs as follows: Arracacha (*Arracacia xanthorrhiza*) 4, eggplant (*Solanum melongena*) 0.33, squash (*Pepo moschata*) 2, chayote (*Sechium edule*) too small to be measured, pigeonpea (*Caján cajan*) 3, chickpea (*Cicer arietinum*) 0.5, string beans (*Phaseolus vulgaris*) 10, mamey (*Mammea americana*) 40, redpepper (*Capsicum annuum*) 33, boiled green plantain (*Musa paradisiaca*) 20, cassava (*Manihot manihot*) 0.5, and okra (*Abelmoschus esculentus*) 6 units per gram of edible portion.

Avitaminosis, XIX—XV (*Soc. Expt. Biol. and Med. Proc.*, 30 (1932), No. 2, pp. 173-175; 30 (1933), No. 5, pp. 620-622).—In continuation of the series noted previously (E.S.R., 68, p. 705), four papers are presented.

XII. Influence of vitamin B deficiency on differential leucocyte count of the albino rat during lactation, B. Sure and K. S. Buchanan (pp. 174, 175).—This paper supplements an earlier study of the effect of vitamin B deficiency in the weaned rat on the differential leucocyte count (E.S.R., 65, p. 494). The technic of the previous study in differentiating between the effects of inanition and vitamin B deficiency per se was followed.

"A summary of all the results discloses that in vitamin B deficiency there is generally a relative lymphopenia and corresponding polymorphonuclear leucocytosis in the lactating albino rat and nursing young, and, while in some groups a specific effect of vitamin B deficiency on such changes was apparent, in the majority of cases this was due to great losses of weight associated with inanition. No noteworthy changes were observed in the monocyte, eosinophil, or basophil counts."

XIII. Effect of vitamin A deficiency and vitamin D deficiency on differential leucocyte count of the albino rat, B. Sure and K. S. Buchanan (pp. 173, 174).—The results obtained were for the most part in agreement with those of Turner and Loew (E.S.R., 66, p. 196), showing that with increasing severity of the

disease there is a relative increase of polymorphonuclear leucocytes and a corresponding decrease in lymphocytes. However, in a number of animals apparently in advanced stages of the avitaminosis no significant changes in the differential leucocyte count were obtained. Determinations of the total leucocyte count in 6 animals suffering from vitamin A deficiency and in 6 controls showed no significant differences, nor were any observed in the monocyte, basophil, or eosinophil counts between the pathological and control animals.

Only the differential leucocyte counts were determined in rats suffering from rickets produced by the Steenbock-Black rachitic diet. No disturbances were observed.

XIV. Effect of vitamin A deficiency on concentration of blood lipids of albino rat. B. Sure, M. C. Kik, and A. E. Church (pp. 620, 621).—The concentration of the blood fatty acids, cholesterol, and phospholipids of rats showing advanced stages of vitamin A deficiency fell within the same range as that of normal controls.

XV. Effect of vitamin D deficiency on concentration of lipids of blood of albino rat. B. Sure, M. C. Kik, and A. E. Church (pp. 621, 622).—Rats suffering from vitamin D deficiency likewise showed no difference in the blood fatty acids, cholesterol, and phospholipids.

Dietary requirements for fertility and lactation.—XXV. Does amount of fat in diet influence vitamin B requirements for lactation? B. SURE (*Soc. Expt. Biol. and Med. Proc.*, 30 (1933), No. 5, pp. 622, 623).—In continuation of the series noted previously (E.S.R., 67, p. 484), the conclusion of Evans and Lepkovsky (E.S.R., 69, p. 468) that fat exerts a sparing action on vitamin B was tested by studies of the lactation efficiency index of rats on three diets containing 10, 20, and 30 percent, respectively, of lard and deficient in vitamin B or vitamins B and G. Two types of yeast, Northwestern dehydrated and Fleischmann's dried, were used in the diets of the control of rats, and the same yeasts autoclaved as a source of vitamin G in the diets deficient only in vitamin B. No data are given in this preliminary report, but it is stated that no benefit in lactation was observed as a result of added fat.

The reducing value of plant juices containing vitamin C as determined by 2,6-dichlorophenol indophenol. H. H. MOTTERN, E. M. NELSON, and R. WALKER (*Jour. Assoc. Off. Agr. Chem.*, 15 (1932), No. 4, pp. 614–616).—Attempts which have been made at the U.S.D.A. Bureau of Chemistry and Soils to correlate the reducing values and oxidative changes in orange juice and the relation of the reducing value to vitamin C are discussed briefly. Although a definite correlation has been shown between the reducing value and the vitamin C content of a few fruits and vegetables rich in vitamin C, the authors are of the opinion that "definite limitations must be placed upon the use of 2,6-dichlorophenolindophenol in estimating vitamin C content as indicated with respect to cabbage juice and to the primary oxidation product of hexuronic acid. The extent to which it can be relied upon to determine the distribution of vitamin C can only be determined by further experimentation. However, it is believed that the titration may be useful in detecting destruction of vitamin C in various steps in the commercial processing of fruits and vegetables."

Attention is called to the fact that decitrated lemon juice has been adopted as the international standard for vitamin C. Observations that the vitamin C content of oranges is decreased by the heavy spraying of orange trees with lead arsenate (E.S.R., 68, p. 418) raised the question of the constancy of the vitamin C potency of lemon juice. "To what extent the vitamin C content of lemon juice may be influenced by environmental conditions cannot be stated at present. If there is a wide range in the vitamin C potency of lemon juice and the variations can be correlated with reducing value of the juice, it may

be desirable to limit the quality of lemon juice that is to serve as a vitamin C standard to that which has a reducing value between certain defined limits."

Vitamins in canned foods.—XIII, Canning tomato juice without vitamin C loss, E. F. KOHMAN, W. H. EDDY, and C. Z. GUBIN (*Indus. and Engin. Chem.*, 25 (1933), No. 6, pp. 682-684, fig. 1; also in *Fruit Prod. Jour. and Amer. Vinegar Indus.*, 12 (1933), No. 10, pp. 299-301, fig. 1).—A new method of canning tomato juice is proposed in which heat instead of vacuum, as in the method described previously (E.S.R., 65, p. 613), is used to remove oxygen from the juice in such a short time that the vitamin C content is unaffected. The equipment required is much more simple than for the vacuum process and thus more practical for the small producer.

In the experimental work reported a cone-shaped colander with a wooden pestle was employed to extract the juice, which dropped immediately upon a steam-heated pipe suspended in a trough from which the juice emerged in a few seconds and was immediately sealed in cans and processed. As the juice is heated to approximately 80° C. the few seconds it remains in the trough, a relatively short processing period is adequate.

Data are given on the growth curves and scurvy symptoms of guinea pigs receiving 3 and 5 cc of three batches of tomato juice as thus prepared and also the same quantities of canned tomatoes, of juice from sieved canned tomatoes, and of a composite sample from five popular brands of commercially canned tomato juice. Growth was said to be practically normal except in the case of the animals receiving the commercial tomato juice. Of the 18 guinea pigs on the three batches of experimental juice, 1 on the 3-cc dosage showed doubtful evidence of scurvy, while of the 6 on commercial tomato juice only 1 animal on the 5-cc dosage was free from scurvy. The 4 receiving canned tomatoes were entirely free from scurvy, and those receiving the juice from sieved canned tomatoes "had no more than dubious symptoms of scurvy."

It is concluded that commercial tomato juice can be prepared by this method with a vitamin content practically equivalent to that of the raw tomatoes from which it is made. Suggestions are also given for combining the heating apparatus with the vacuum chamber described previously.

Disappearance of vitamin C from adrenals of guinea pigs having scurvy, A. E. SIEHRS and C. O. MILLER (*Soc. Expt. Biol. and Med. Proc.*, 30 (1933), No. 6, pp. 696-698).—Guinea pigs on the Sherman-LaMer-Campbell scorbutic diet were killed at varying periods of from 2 to 18 days, and the adrenals removed, sliced, placed in neutral 0.4 percent silver nitrate solution for 15 minutes, and exposed to the light from a 115-w Mazda bulb at a distance of 8 in. At the beginning of the experiment the cut surfaces turned dark brown, but this color changed progressively to a reddish orange by the fifth day. The intensity of the reduction decreased progressively until it was scarcely noticeable on the sixth day. The animals that were not sacrificed continued to gain weight until the eleventh day, and with one exception showed no hemorrhagic areas about the joints. Beginning with the eighteenth day, the surviving animals were given 3 cc of orange juice daily. In one animal killed on the twenty-second day the sliced adrenals showed a marked blackening in silver nitrate.

In guinea pigs on a diet of oats and carrots the adrenals of adults turned black in silver nitrate, while those from young animals turned a dark brown.

The authors conclude that the amount of vitamin C which the guinea pig can store is smaller than generally thought and is rapidly lost either by excretion or by metabolism. "Since considerable time elapses between the disappearance of vitamin C from the adrenal and the development of the gross symptoms, it seems to us that the gross symptoms of scurvy are secondary changes arising as a result of the altered metabolism of the vitamin C-deficient animal."

Hypertrophy of the adrenals in scurvy, A. J. QUICK (*Soc. Expt. Biol. and Med. Proc.*, 30 (1933), No. 6, pp. 753, 754).—Hypertrophy of the adrenals in scorbutic guinea pigs is noted, together with the absence of reduction of silver nitrate in scorbutic as compared with normal animals. "This seems to indicate a complete depletion of the hexuronic acid in the terminal stages of scurvy. The relationship of vitamin C to the cortical hormone is not known, but it is interesting to note that in acute cortical deficiency a marked capillary permeability is observed, while in scurvy there is presumably also an alteration in the permeability of the capillaries resulting in diffuse hemorrhages."

A reliable method for the production of nutritional anemia in white rats, R. S. HARRIS (*Science*, 76 (1932), No. 1978, pp. 495, 496, fig. 1).—Whole dried milk, Klim, has been found to be very satisfactory for producing anemia in young rats. Advantages claimed for it in comparison with fresh milk are lowered mortality, less variation in the degree of anemia at the end of a given period of time, more rapid lowering of the hemoglobin, and more rapid growth. The three lots of Klim used in the tests reported contained about 0.00024 percent of iron as determined by the standard colorimetric-thiocyanate method and no copper detectable by the pyridine-carbon tetrachloride-thiocyanate method.

The occurrence of mottled teeth in Iowa, C. T. OSTREM, V. E. NELSON, D. A. GREENWOOD, and H. A. WILHELM (*Science*, 76 (1932), No. 1981, pp. 575, 576).—Attention is called to the appearance of mottled teeth in a district in Iowa, one of the States in which the condition has not been reported previously. It is considered probable that the trouble began after the sinking of deep wells in this region, inasmuch as the cases thus far noted have occurred in children born at approximately the time when deep wells were installed. Qualitative spectrographic tests of the drinking water from the deep wells showed the characteristic fluorine band, while a sample of shallow well water from the same region gave no qualitative test for fluorine. Quantitative tests of the deep well water gave tentative values of 10 and 15 parts of fluorine per million.

Four years of daily measurement of the ultraviolet component of sunlight by the acetone-methylene blue method, W. C. RUSSELL, C. H. HOWARD, and O. N. MASSENGALE (*Amer. Jour. Hyg.*, 16 (1932), No. 1, pp. 192-205, figs. 9).—This contribution from the New Jersey Experiment Stations reports a critical study of the acetone-methylene blue method of measuring the ultraviolet radiation from the sun, as described by Hill (*E.S.R.*, 60, p. 122), with results of daily observations for the period August 1, 1926, to July 31, 1930, at New Brunswick, N.J. These observations were compared with the corresponding hours of sunshine in a neighboring locality and with data on ultraviolet radiation in other parts of the world as recorded in the literature. A special study was made of the effect of temperature on the rate of bleaching of the acetone-methylene blue solution, and an approximate temperature coefficient was determined for the conversion of readings at winter temperature to a summer temperature basis. The percentage transmission of ultraviolet light by the glass substitute Cel-O-Glass was determined and correlated with the biological effects of sunshine through Cel-O-Glass on bone formation in the chicken.

TEXTILES AND CLOTHING

Uses for cotton: Selected references in the English language, compiled by M. C. BENTON (*U.S. Dept. Agr., Bur. Agr. Econ. Bibliog.* 44 (1932), pp. 43).—This bibliography lists 266 references to books, pamphlets, and periodical articles, largely between 1910 and November 1932, which show the variety of uses for cotton. An index and a list of agricultural economic bibliographies are appended.

HOME MANAGEMENT AND EQUIPMENT

Durable finishes for any kind of floor, C. H. JEFFERSON (*Michigan Sta. Quart. Bul.*, 15 (1933), No. 4, pp. 282-287, figs. 6).—Results of experiments on floor finishes are briefly summarized.

Results indicated that finishes that remain on the surface did not stand up under heavy traffic, but that finishes which penetrated the wood instead of remaining on the surface showed greater durability. It was also found that the penetrating finishes are quickly and easily removed. Badly worn varnish finishes must be removed before a new finish is applied if a smooth uniform surface is to be obtained, and penetrating finishes are not satisfactory over varnish or wax. The water-solvent or no-buff waxes were more easily applied, more durable, and less slippery than the ordinary paste waxes, and the no-buff waxes seemed to be more durable over the penetrating finishes than over varnish. The penetrating finish without a coat of wax was found to be more desirable on kitchen floors, and a thin coat of wax more durable than a thick coat.

Cold facts, B. G. DANNER (*Ga. Agr. Col. Bul.* 433 (1933), pp. 23, figs. 3).—This bulletin considers some of the factors governing the use and care of the refrigerator which will increase the efficiency and prolong the service for food preservation and dessert freezing.

MISCELLANEOUS

Report of the director [of Connecticut Storrs Station], 1932, W. L. SLATE (*Connecticut Storrs Sta. Bul.* 181 (1932), pp. 14).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Biennial Report of the Missouri State Fruit Experiment Station, Mountain Grove, Mo., 1931-1932, F. W. FAUROT (*Missouri Fruit Sta. Bien. Rpt.* 1931-32, pp. 7).—The work and needs of the station are briefly discussed.

Forty-sixth Annual Report of [Nebraska Station, 1932], [W. W. BURR] (*Nebraska Sta. Rpt.* [1932], pp. 49).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Report of the Virgin Islands Agricultural Experiment Station, 1932, G. BRIGGS ET AL. (*Virgin Islands Sta. Rpt.* 1932, pp. [2]+21, figs. 7).—This, the final report on this station as administered by the U.S. Department of Agriculture (E.S.R., 67, p. 353), briefly reviews the activities as a whole and reports experimental work for the year, for the most part noted elsewhere in this issue. Meteorological observations on St. Croix by A. Bisserup (p. 21) are also included.

Michigan Agricultural Experiment Station Quarterly Bulletin, [May 1933], edited by V. R. GARDNER and A. J. PATCH (*Michigan Sta. Quart. Bul.*, 15 (1933), No. 4, pp. 217-310, figs. 27).—In addition to articles noted elsewhere in this issue or previously, this number contains the following: The European Starling (*Sturnus vulgaris*) in Michigan, by J. W. Stack (pp. 240-242); and Seed Flax Variety Yields in Michigan, by B. B. Robinson (pp. 274, 275).

Abstracts of Bulletins 442-473, Circulars 61-66, and other publications during 1932, A. D. JACKSON (*Texas Sta. Circ.* 68 (1932), pp. 38).—In addition to abstracts of the station's own publications as indicated, this circular contains abstracts of articles contributed by members of the staff for publication elsewhere, for the most part previously noted or abstracted elsewhere in this issue.

Institutions for agricultural experimentation in temperate countries (*Les Institutions d'Expérimentation Agricole dans les Pays Tempérés*. Roma: Inst. Internatl. Agr., 1933, pp. VII+306, figs. 19).—This handbook is discussed editorially on page 481.

NOTES

Kansas College and Station.—W. L. Latshaw, professor of chemistry and in charge of the analytical laboratory, has resigned effective July 15 to accept a commercial position in Salt Lake City, Utah. F. G. Ackerman, foreman of the agronomy farm, resigned effective July 1.

Maine Station.—Dr. Clarence R. Phipps, associate entomologist from 1925 to 1931 and subsequently entomologist, died June 21 at the age of 33 years. He was a native of Massachusetts and graduate of the Massachusetts College in 1919, and received the M.S. degree from the Iowa College in 1927 and the Ph.D. degree from Cornell University in 1930. He was assistant in entomology in the New York State Station from 1919 to 1921 and entomologist in the Missouri Fruit Station from 1921 to 1925. His distinctive contribution in Maine had dealt with blueberry and apple insects.

Michigan College and Station.—Following action by the legislature reducing State appropriations to \$1,000,000 per annum for the current biennium, or 28 percent less than for the previous biennium, reductions of \$500,000 were made by the State Board of Agriculture at its July meeting. These included further salary cuts of 4 to 18 percent on salaries over \$1,000 and a reduction of 22.1 percent in maintenance expense.

Ernest L. Anthony, head of the dairy department, has been appointed dean of the agricultural division in addition to his former duties.

Minnesota Station.—A new earlier and higher-yielding potato developed at the station is being introduced this fall. This potato has been named Warba, a Chippewa Indian name for earliness. The potato, originated as a seedling from a cross of Bliss Triumph with a selected seedling known as Minnesota 4-16, represents 10 years of work under the direction of the division of horticulture. In 1931 the average yield by eight Minnesota growers was 278 bu. an acre, as compared with 260 bu. from Irish Cobbler. The season for Warba is from 10 to 14 days shorter than for Irish Cobbler and from 7 to 10 days shorter than that of Early Ohio and Bliss Triumph. Disease tests show that it is resistant to the common forms of mosaic. The tubers are white, round, and blocky and have a crisp white flesh and an excellent cooking quality.

A new graph has been devised by the dairy division, by which, knowing the price per ton of corn and of cottonseed meal, a dairyman may determine readily the exact value for feeding purposes of a ton of any of the common dairy feeds, based on both the protein and the nonprotein nutrients contained in it.

Dr. H. K. Hayes, chief of the division of agronomy and plant genetics, has returned from a year spent at New York State College of Agriculture, where he served as acting professor of plant breeding.

Mississippi Station.—Dorothy Dickins has resumed work as head of the department of home economics, following a two years' leave of absence for graduate work at the University of Chicago. R. H. Means, assistant in animal husbandry, has been granted leave of absence until May 1, 1934.

Missouri University and Station.—*Science* notes that Merritt F. Miller, chairman of the department of soils, has been granted a year's leave of absence to be spent in studying soil formation and soil management in Europe.

A bronze tablet in memory of Dr. George Clinton Swallow, first professor of geology, chemistry, and agriculture and first dean of the College of Agriculture, was unveiled at the recent commencement. The tablet was erected by the Boone County Historical Society, the Agricultural Club, and the Geological Club, and commemorates Dr. Swallow's work at the university, beginning in 1852 and, after an interval from 1853 to 1870 as State geologist, continuing until 1882.

Montana College and Station.—Dr. Robert Emerson Wall, assistant professor of entomology and assistant entomologist, since January 1, 1931, died July 29 at Eveleth, Minn., at the age of 30 years. He was born at Neodesha, Kans., and was graduated from the Colorado College in 1924. He had held positions there and at the University of Minnesota and received the Ph.D. degree from the latter institution in 1930. From 1926 to 1928 he was instructor at Lingnan University, Canton, China.

New Jersey Stations.—Following recent drastic reductions in the State appropriations, a supplemental appropriation of \$83,000 was granted to the university, a part of which will be allocated to the College of Agriculture. Repairs to greenhouses have been made, as well as an installation of tanks for the culture of oysters under controlled conditions. A recent installation of cooling towers has facilitated the production of large quantities of distilled water for plant culture experiments.

Cooperative investigations are under way by the departments of biochemistry and poultry husbandry on the nutrition of poultry.

New Mexico College.—R. L. Young, president of the board of regents and influential in locating the college in the Las Cruces region, died July 4.

Ohio State University.—Dr. Herbert Osborn, associated with the work of the institution since 1898, has been appointed emeritus professor of zoology and entomology and has retired from active teaching in conformity with the provisions of the State teachers' retirement system. It is announced that he will continue his research work with the facilities of the department and as director of the Ohio Biological Survey.

South Dakota College and Station.—Sherman E. Johnson, head of the department of agricultural economics, has been granted leave of absence to assist the Brookings Institute at Washington, D.C., during the ensuing year.

Washington College.—A livestock judging pavilion, 150 by 36 ft., will be ready for use during the fall semester.

Cold storage equipment for experimental work in fruit and vegetable storage problems and for class work with meats, poultry products, fruits, and vegetables has been installed. An additional greenhouse unit to be used for experimental work in horticulture has just been completed. This unit is 20 by 100 ft. and is divided into four sections with automatic temperature control for each section.

Wisconsin University and Station.—A special grant has been made by the Wisconsin Alumni Research Foundation to the support of research in the university, which it is hoped will prove sufficient to prevent the suspension of all important projects threatened by the reduced appropriations of the emergency period. Approximately \$22,500 of the total thus made available has been allocated to members of the staff of the station.

The foundation has also established a chair of game management, which during the next five years will endeavor to develop and apply methods of raising game birds and animals as a part of regular farming operations. Under the plans as projected, development of game crops eventually is expected to furnish the farmer income through an arrangement by which

hunters will pay him a reasonable fee for his part in a triple game-raising partnership of State, landowner, and sportsman. The work will be demonstrated in the new university arboretum and on typical farms in various areas of the State. Song birds and other wild life will also benefit by the food and cover provided for game. Aldo Leopold, formerly of the U.S.D.A. Forest Service, has been appointed in charge of this project and will also serve as director of the arboretum and wild life refuge adjacent to Lake Wingra.

Office of Experiment Stations.—William E. Boyd, assistant botanist from 1911 until his retirement on February 28, 1933, died in Washington, D.C., on August 25. He was a native of Arkansas and a graduate of Valparaiso University and the University of Chicago. His services for *Experiment Station Record* have been discussed editorially (E.S.R., 68, p. 573).

Agricultural Education and Research in Nanking University.—Under a regulation recently adopted by the Ministry of Education of the National Chinese Government, the number of students admitted to courses in arts, law, education, and fine arts is to be limited, beginning with the fall of 1933, to the number admitted in science, medicine, engineering, and agriculture. The present proportion is about 70 to 30 in the two groups, and the regulation is a substantial recognition of the need for trained agriculturists in China.

The Nanking Theological Seminary is offering a rural church major course, which involves a combination of theological and rural training. Under the plan adopted students who have completed two years of basic theological work at the seminary may spend the third year at the rural leaders' training school, electing courses pertaining to agriculture and rural problems. The fourth year the students will be returned to the seminary, and the course as a whole will lead to the regular seminary certificate.

A gift of \$20,000 to the college of agriculture and forestry has been made by General Chiang Kai-Shek for the strengthening of its crop improvement program, especially in Shensi, where it is hoped to establish a new experiment station.

New Journals.—*Zeitschrift für Vitaminforschung* is being published quarterly at Bern to present articles in vitaminology and related food problems. The initial number contains the following: Animal Experimentation on the Influence of Vitamin Preparations on the Bactericidal Power of the Blood, by T. Holsen (pp. 3-25); Investigations on the Relation between Vitamin D Deficiency and Anemia, by H. Hauss (pp. 26-38); and Avitaminosis and Unapparent Dystrophia, by G. Mouriquand (pp. 38-51). Reviews and abstracts are also included.

Revista del Departamento de Agricultura is a monthly issued as the official organ of the Department of Agriculture, Commerce, and Industries of Ecuador. The initial number contains several articles dealing with the culture of cacao, cotton, and coffee, the importance of fruit growing in Ecuador, and other topics.

Miscellaneous.—Dr. Henry C. Taylor has been appointed by President Roosevelt as the representative of the United States on the permanent committee of the International Institute of Agriculture at Roma. This appointment follows action taken by Congress at its recent session providing for representation by the United States in the work of the Institute after a lapse of several years.

Dr. Otto Appel has resigned as director of the Biological Institute of Agriculture and Forestry at Berlin-Dahlem, Germany, but will continue to give instruction in the Agricultural Academy.

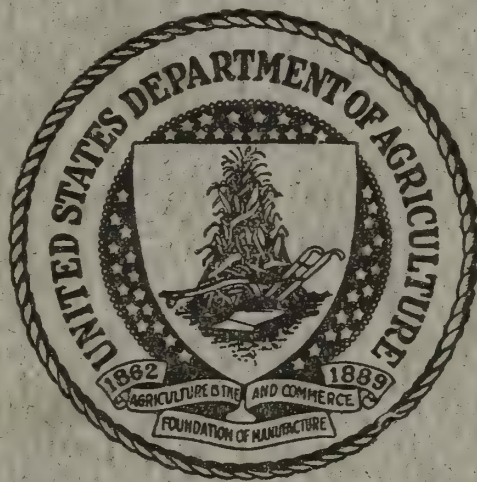
UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS

Vol. 69

NOVEMBER 1933

No. 5

EXPERIMENT STATION RECORD



By direction of the Secretary of Agriculture, the matter contained herein
is published as administrative information required for the
proper transaction of the public business

For sale by the Superintendent of Documents, Washington, D.C. - - - - - Price 15 cents.
Subscription per volume (2 volumes a year) consisting of 6 monthly numbers and index, \$1.00
Foreign subscription per volume, \$1.50

EXPERIMENT STATION RECORD

EDITOR: HOWARD LAWTON KNIGHT

EDITORIAL DEPARTMENTS

Agricultural and Biological Chemistry—H. C. WATERMAN, SYBIL L. SMITH.
Agricultural Meteorology—W. H. BEAL.
Soils and Fertilizers—H. C. WATERMAN.
Agricultural Botany, Diseases of Plants—J. W. WELLINGTON, H. M. STEECE
F. V. RAND.
Genetics—H. M. STEECE, J. W. WELLINGTON, G. HAINES.
Field Crops—H. M. STEECE.
Horticulture and Forestry—J. W. WELLINGTON.
Economic Zoology and Entomology, Veterinary Medicine—W. A. HOOKER.
Animal Husbandry, Dairying, and Dairy Farming—H. W. MARSTON.
Agricultural Engineering—R. W. TRULLINGER.
Agricultural Economics—F. G. HARDEN, B. YOUNGBLOOD.
Rural Sociology—B. YOUNGBLOOD, F. G. HARDEN.
Agricultural and Home Economics Education—F. G. HARDEN.
Foods and Human Nutrition—SYBIL L. SMITH.
Textiles and Clothing—H. M. STEECE, SYBIL L. SMITH.
Home Management and Equipment—
Indexes—MARTHA C. GUNDLACH.
Bibliographies—CORA L. FELDKAMP.

CONTENTS OF VOL. 69, NO. 5

Editorial:	Page
The agricultural experiment stations in 1932.....	625
Recent work in agricultural science.....	630
Agricultural and biological chemistry.....	630
Agricultural meteorology.....	634
Soils—fertilizers.....	634
Agricultural botany.....	637
Genetics.....	638
Field crops.....	643
Horticulture.....	651
Forestry.....	660
Diseases of plants.....	663
Economic zoology—entomology.....	681
Animal production.....	697
Dairy farming—dairying.....	705
Veterinary medicine.....	709
Agricultural engineering.....	720
Agricultural economics.....	736
Rural sociology.....	744
Agricultural and home economics education.....	746
Foods—human nutrition.....	746
Textiles and clothing.....	764
Home management and equipment.....	765
Miscellaneous.....	766
Notes.....	767

EXPERIMENT STATION RECORD

VOL. 69

NOVEMBER 1933

No. 5

EDITORIAL

THE AGRICULTURAL EXPERIMENT STATIONS IN 1932

The report recently issued by the Office of Experiment Stations on the work and expenditures of the agricultural experiment stations during the fiscal year ended June 30, 1932, extends by another year the period for which summarized information is available for this group of institutions as a whole. It reveals how the funds available for the support of the State experiment stations and those in Alaska, Hawaii, Puerto Rico, Guam, and the Virgin Islands were used during the year, and what were some of the more significant results of their work, particularly from the standpoint of practical application and service. It also gives information on personnel, facilities for research, research programs and projects and their coordination and readjustment, and other matters pertaining to the organization, administration, and progress of the stations.

The total income of the stations for the year was \$17,245,163.83. This was a reduction from the previous year of \$811,118.24, principally because of a decrease in accumulated balances carried over, in fees, and in sales receipts. The Federal appropriations of \$4,587,030 were maintained in full, and there was an actual increase from \$9,166,554.19 to \$9,501,097.10 in the State appropriations and allotments. The net effect of these changes was to decrease the total income in 36 States by amounts ranging from \$186 to \$172,901, and to increase that available in the 12 States remaining by amounts ranging from \$846 to \$122,343. On a percentage basis, it is stated that "reduction of financial support ranged all the way from 0.4 to 80 percent, necessitating in some cases drastic cuts in salaries and maintenance, with loss of seasoned and experienced staff members, abandonment of important investigations and useful service work, and curtailment of published output, but on the whole with more intensive work on major problems that were pressing for immediate attention."

The shrinkage in revenues was also reflected in a reduction in expenditures for research facilities. The value of additions to build-

ings and equipment for experiment station use declined from \$2,565,317 in 1931 to \$1,885,003 in 1932. The amount reported as expended for buildings used in part or exclusively by the stations was \$1,131,710 in 1932 as compared with \$1,478,152 in 1931; for scientific apparatus, \$220,300 in 1932 as compared with \$350,847 in 1931; for farm implements and machinery, \$205,845 in 1932 as compared with \$224,145 in 1931; for livestock, \$133,522 in 1932 as compared with \$151,193 in 1931; for library purposes, \$55,281 in 1932 as compared with \$65,222 in 1931; and for miscellaneous purposes, \$138,343 in 1932 as compared with \$295,755 in 1931. "These figures indicate sharp economies in expenditures for buildings, equipment, and similar purposes to leave a maximum for maintenance of staff and service."

Notwithstanding these handicaps, it is made clear that "substantial progress was made during the year in developing the intensive and productive scientific research that is basic to the improvement of practice, in more efficient use of limited resources, and in aiding to solve some of the more immediate and acute problems arising out of the depressed condition of agriculture." Much attention was given to revising research programs and projects and adjusting them to reduced financial support and to emergency needs. "The utmost discrimination was exercised in selecting problems for investigation, with special reference to their application to the depressed economic situation; more effective cooperation of various research agencies in the study of major problems was developed; and substantial economies were effected."

Progress in coordination in agricultural research by Federal and State agencies was evident during the year, especially in the better organization and administration of cooperative projects and in the growth of the cooperative spirit. A decrease in the number of cooperative undertakings between the stations and the Department as recorded by the Office is attributed to the completion of several studies, the consolidation of others in the interest of service and economy, and to the rather widespread curtailment of financial resources available for research.

All but one of the stations cooperated with bureaus of the Department during the year, and the number of cooperative agreements per station ranged as high as 43. Among the lines of work in which cooperation was most extensive were the soil surveys, representing practically every major agricultural area in the country; prevention of soil erosion; improvement of irrigation practices; utilization and cost of farm power; use of concentrated fertilizers; fertilizer requirements of potatoes on different soil types; machine placing of fertilizers for cotton, corn, potatoes, and canning crops; improvement of corn and other cereals; breeding of improved varieties of potatoes

resistant to disease; establishment of type varieties of vegetables; use of parasites to combat the oriental fruit moth; increasing the efficiency of oil sprays; plant-disease survey; relation of conformation and anatomy of the dairy cow to productive ability; use of proved sires in breeding for high milk and butterfat production; beefiness and milk production in dual-purpose cattle; quality and palatability of meat; the growth of wool; prevention and eradication of contagious abortion of cattle; economic and sociological survey of the Appalachian highlands region; types of farming; cotton grades and market prices; livestock production, marketing, and meat utilization in areas released from cattle-tick quarantine; and establishment of a farm real estate tax index. Such cooperation is thus being aimed at important specific regional and national problems, and is coordinating to a high degree the efforts of the interested research agencies and the use of the best facilities available.

Through revision, readjustment, and coordination of research programs and projects the stations not only effected substantial economies in the use of funds, but were able to put increased emphasis on urgent economic problems of the farm and farm home. Of the 1,458 Purnell projects, 348, involving an expenditure of \$781,000, dealt with economic problems; 53, involving an expenditure of \$113,000 of Purnell funds, with rural social conditions; and 145, calling for an expenditure of \$273,000, with home economics problems. It appears that one third of the Purnell projects and nearly one half of the Purnell fund were devoted to investigations in these three fields. The distribution of Purnell projects by other major objectives was as follows: Improving animal production, 205, with an allotment of \$461,000 of Purnell funds; improving horticultural practice and products, 118, with \$197,000; control of plant diseases, 103, with \$133,000; control of insect and other pests, 96, with \$145,000; improving culture and quality of field crops, 89, with \$180,000; maintaining soil fertility and securing better use of fertilizers, 70, with \$168,000; extending applications of engineering to farm and farm-home problems, 59, with \$104,000; and control of diseases of livestock, 52, with an allotment of \$98,000 of Purnell funds. A tendency was noted, particularly in case of Purnell projects, to concentrate on those of more immediate importance or that might be completed in a relatively short time.

In a special article dealing with research in agricultural economics and rural sociology, the conception of natural-science research as "production research" with the intimation that it is the cause of surpluses, low prices, and depressions, is shown to be inaccurate and misleading. "As a matter of record," it is stated, "American agriculture frequently experienced surpluses, low prices, and depressions before the establishment of institutions of agricultural research and

education in the United States. We must, therefore, look beyond production research for the causes of agricultural depression and take into account growth of rural population, expansion of arable lands, increased facilities and incentives to production, unfounded optimism about prospective demand, and the lack of a feasible plan for adjusting production to consumption." Also, "the natural sciences, by showing how to lower costs of production, maintain fundamental soil resources, prevent losses from diseases and pests, enhance the quality of farm products to better serve both producer and consumer, develop new uses for surplus products, and increase conveniences and lighten the physical burdens of farming and home making, have contributed immensely to the improvement of farm incomes and to the comforts and satisfactions of rural life."

These studies have been logically supplemented by the initiation of research in agricultural economics and rural life, and remarkable progress has been made in these specific fields. During the year the number of active station projects increased by 17. Of the total number, 24 projects were on costs of production, 124 on farm management, 143 on marketing and prices, 23 on taxation, 7 on credits, 6 on tenancy, 17 on land economics, and 4 on less specialized problems. The record indicates an increasing public interest in the study of problems pertaining to land utilization, adjustments in farm management, marketing, and related problems in the fields of rural taxation and agricultural finance.

There was also an increase of 17 in the number of active projects in rural sociology, raising the total to 53. Of these, 7 dealt with rural population, 10 with standards of living, 3 with rural institutions, 10 with farm organizations, 10 with communities, 5 with rural-urban relations, 2 with rural social psychological problems, 5 with rural social pathological problems, and 1 unclassified. In this field the major emphasis is on rural groups, organizations and institutions, and standards of living.

"Obviously, the field of rural-life research is only partially developed. Considering the paucity of dependable information on rural-welfare problems, greater consideration might well be given to problems of rural population, rural-urban migrations and their social effects, and the relative noneconomic, human advantages of rural and urban areas. Rural welfare might also be advanced by giving more attention to the social obligations of farmers' organizations, and particularly to rural destitution in the present depression."

As usual the bulk of the report is devoted to a recapitulation of some of the more outstanding achievements of the stations during the year. Special attention is given to recent contributions toward the solution of certain major and more urgent practical problems

in such fields as conserving and increasing soil fertility, introducing new and better crops and methods of farm management, reducing losses from plant and animal diseases and insect pests, improving methods of breeding and feeding animals, and otherwise reducing production costs; aiding marketing and increasing financial returns by improving quality of product; finding profitable means of utilizing surpluses, waste products, and by-products; and aiding rural people to make better use of their resources in improving living conditions.

A final section points out that while the primary function of the stations is research, these institutions are also called upon for various kinds of regulatory, advisory, and other service to an extent not always realized. For example, "the station specialists are frequently called on to investigate outbreaks of plant and animal diseases and insect pests and to suggest emergency measures for their control. In like manner they are called on to furnish facts and advice to educational agencies and other organizations in activities in the interest especially of agriculture and rural life, but frequently of urban life as well. Maintaining in each State such technical agencies prepared to make the accumulated findings of over half a century of scientific research immediately available in the adjustments necessarily under way during the year merits special emphasis. The service rendered in this capacity is an outstanding contribution of the experiment stations."

The report is of special interest as the first for the period of declining revenues which has subsequently continued in intensified degree. It indicates some of the readjustments which are being necessitated, and foreshadows the handicaps to complete effectiveness which these are entailing. Even more clearly, however, does it reveal the usefulness of experiment stations to agriculture and rural life in this as in other emergency periods and the extent to which they are being looked to for constructive leadership and sound counsel.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Recent advances in the chemistry of vitamins, I. B. ROUTH (*Jour. Chem. Ed.*, 10 (1933), No. 1, pp. 13-19).—This review, published in January 1933, deals particularly with the structural chemistry of the vitamins as established at the time of writing. A list of 45 references to the literature is appended.

Vitamin studies.—V, Chemical methods for vitamin determination.—1, The Bezssonoff reaction [trans. title], F. V. v. HAHN and M. WEIBEN (*Ztschr. Untersuch. Lebensmtl.*, 63 (1932), No. 5, pp. 481-495).—A comparison is reported of the antiscorbutic values of various foods determined biologically, as noted in the third and fourth papers of the series (E.S.R., 68, p. 861), with values obtained in the blue color test of Bezssonoff (E.S.R., 56, p. 12). No satisfactory agreement was shown between the two values, and the authors conclude that unless controlled by animal experiments the Bezssonoff test is without value.

The determination of vitamin A in cod-liver oils, (a) biologically, (b) chemically, (c) physically, with a statistical examination of the results.—II, Further evidence that the intensity of absorption at 328 $m\mu$ gives the best agreement with the biological measure of vitamin A in cod-liver oils, K. H. COWARD, F. J. DYER, and R. A. MORTON (*Biochem. Jour.*, 26 (1932), No. 5, pp. 1593-1600).—Four oils of the previous study (E.S.R., 67, p. 200) and five further samples of cod-liver oil were examined by the same biological, chemical, and physical methods as described in the earlier paper, with results confirming the conclusion that the intensity of absorption at 328 $m\mu$ of the oil itself gives the best measure of the vitamin A value of the oil.

In retesting the old oils, the blue value of the unsaponifiable fraction again gave better agreement with the biological value than that of the oil itself, but with freshly prepared oils all of the methods of measuring the blue value gave approximately the same results.

Evidence is presented suggesting the advisability in estimating the vitamin A content of a substance of making a simultaneous test on the standard rather than comparing the oil with an average value for the standard oil.

A note added in proof calls attention to a statement by A. Chevallier at the 1932 meeting of the International Physiological Congress to the effect that the presence of free fatty acids in oils interferes with the measurement of the 238 $m\mu$ band, and that consequently the intensity of absorption at 328 $m\mu$ is reliable as a measure of vitamin A only in fresh oils or in older oils having a low free fatty acid value.

The vaginal smear method of determining vitamin A, C. A. BAUMANN and H. STEENBOCK (*Science*, 76 (1932), No. 1975, pp. 417-420).—A comparison of the sensitivity of the growth method, the ophthalmic method, and the vaginal smear method to uniform dosage with carotene as the source of vitamin A is reported, with the conclusion that the vaginal smear method can be used

as a quantitative method for the determination of vitamin A. Desirable and undesirable features of the method are summarized briefly.

The chemical nature of vitamin C or vitamins C [trans. title], L. RANDOIN and R. NETTER (*Bul. Soc. Chim. Biol.*, 15 (1933), No. 2, pp. 275-303).—In this review of recent literature the authors have summarized and discussed the evidence leading to the conflicting views of Bezssonoff and of Rygh on the one hand and Szent-Györgyi on the other concerning the chemical nature of vitamin C, the former considering the vitamin to be an alkaloid with two phenolic groups and the latter an acid carbohydrate derivative, hexuronic acid.

A list of 62 references to the literature is appended.

Some properties of ergosterol and calciferol, A. L. BACHARACH, E. L. SMITH, and S. G. STEVENSON (*Analyst*, 58 (1933), No. 684, pp. 128-135).—In the capacity of buyers of ergosterol and sellers of calciferol, crystalline vitamin D, the authors have redetermined the physical constants of these substances from products prepared on a commercial scale. For each, descriptions are given under the headings source, constitution, appearance, stability, melting point, optical activity, ultraviolet absorption at 281 m μ , color and other reactions, and physiological activity. Provisional specifications are given for pure ergosterol and pure calciferol as to melting point, optical activity, ultraviolet absorption, and for calciferol antirachitic activity. Ergosterol is considered to crystallize with, and calciferol without one molecule of water of crystallization, the empirical formulas being C₂₈H₄₄O.H₂O and C₂₈H₄₄O, respectively.

The quantitative determination of vitamin D by means of its growth-promoting property, K. H. COWARD, K. M. KEY, and B. G. E. MORGAN (*Biochem. Jour.*, 26 (1932), No. 5, pp. 1585-1592, fig. 1).—The authors have developed and determined the degree of accuracy of a growth-promoting method for vitamin D similar to the one previously developed and tested for vitamin A (E.S.R., 68, p. 565). The basal diet was the same as in the A determinations, except that in place of a supplement of vitamin D throughout the preparatory and test period a supplement of vitamin A (carotene) was used.

The growth responses of the animals were found to be graded to the dose of vitamin D given, and as in the A experiments were greater for the bucks than the does. The degree of accuracy of the method as applied to bucks was only about one third of that obtained in the vitamin A tests, and to does slightly greater than that in the vitamin A tests.

Attention is called to two points of biological interest noted in the course of the investigation. One is a difference in the behavior of young rats on the basal diet for testing for vitamins A and D and in their response to supplements of the vitamin. On the vitamin D-free diet the young rats grew more slowly than on a similar vitamin A-free diet, and after cessation of growth did not lose weight as rapidly as in the A experiments. The response to doses of vitamin D was also less than to doses of vitamin A. The other point is the consistently lower response to doses of vitamin D of the animals which received vitamin A as 0.04 mg of petroleum ether soluble fraction of dried carrots than of the animals which received the vitamin A as 0.04 mg of crystalline carotene. Questions are raised but not answered concerning the significance of these observations.

In discussing the relative merits of the line test and the growth test for vitamin D, the authors state that "the degree of accuracy obtainable by the line test in this laboratory has not yet been worked out. Tests of the same substances by the line test and by the growth method have given identical results. The growth method is, therefore, thought to measure the same factor

as the line test. It is not, however, as quick a method as the line test, and it is highly improbable that its degree of accuracy is any greater than that of the line test. It is, therefore, not recommended for routine testing."

The cupric complexes of glycine and of alanine, H. BORSOOK and K. V. THIMANN (*Jour. Biol. Chem.*, 98 (1932), No. 2, pp. 671-705, figs. 5).—The equilibrium relations existing in solution at room temperature between cupric ions and glycine and alanine were studied by measurement of the absorption in the visible spectrum, and by copper electrode potentials, through a range of H-ion concentrations from pH 0 to 13.

The variations in absorption indicated the existence of at least four types of complexes with both glycine and alanine. According to the range of H-ion concentration in which each predominates, they are designated as first acid, second acid, neutral, and basic complexes. The approximate ranges of H-ion and relative amino acid concentrations, in which each type of complex predominates, are delimited. The absolute absorption spectra, in the visible region, of each of the eight complexes in a pure state were determined. In some cases these were obtained directly, in others by deduction from mixtures. From these curves the absorption spectra of all the mixed systems examined could be derived. The constitution of these eight compounds was deduced from potentiometric and spectrophotometric data. Of these the constitutions of the second acid glycine, neutral alanine, and basic alanine were found uncertain. The number of H ions set free in the formation of all except the two basic compounds was estimated. The orders of magnitude of the instability constants of the first acid and neutral copper-glycines and of the first acid, second acid, and neutral copper-alanines were determined. The significance, in Donnan equilibria involving proteins, of the phenomena described, is discussed.

The o-quinone test for cysteine, O. BAUDISCH and E. DYER (*Jour. Biol. Chem.*, 99 (1933), No. 2, pp. 485-492).—In extension of previous work (E.S.R., 69, p. 4) the authors find that the o-quinone reaction of cysteine may be used to distinguish cysteine from a large number of related nitrogenous and sulfur-containing substances. The test should be carried out in weak hydrochloric acid solution. Two products have been isolated from the reaction of cysteine with o-quinone: Catechol "and a red-brown substance containing sulfur and nitrogen which is under investigation at present. The formation of the characteristic red compound is not affected by changing the solvent."

The basic amino acids of livetin, T. H. JUKES and H. D. KAY (*Jour. Biol. Chem.*, 98 (1932), No. 2, pp. 783-788).—As determined by the arginase method the livetin preparation examined by the authors contained 11.7 percent of its nitrogen in the form of arginine nitrogen. The corresponding value for vitellin was 14.7 percent. Livetin contained 2.3 percent of cystine according to the Sullivan method, while vitellin contained 1.1 percent. Isolation of the basic amino acids of livetin gave a nitrogen distribution of 10.3 percent arginine N, 2.11 percent histidine N, and 5.92 percent lysine N.

Cytochrome and yeast iron, T. B. COOLIDGE (*Jour. Biol. Chem.*, 98 (1932), No. 2, pp. 755-764, fig. 1).—In the investigation reported upon, "the oxidation-reduction potential of cytochrome has been determined and shown to be the same in artificially prepared solutions as in the yeast cell, namely, +0.260 v (referred to the normal hydrogen electrode). Extracted with the cytochrome is a colorless iron compound, whose apparent mid-point potential at pH 7.0 in the presence of protein is about +0.20 v. It is estimated that in the purest preparations of cytochrome heretofore obtained at least two thirds of the iron present is in the form of this compound, and that the cytochrome iron forms 0.3 percent or less of the total yeast iron. It has been shown that the presence of protein

raises markedly the oxidation potential of the ferrous-ferric system in various buffers, probably because a strong iron-protein complex is formed. The above colorless iron compound present in yeast is such a complex, and its potential is the same as that of the artificially prepared iron-protein complex. Moreover, removal of protein from the yeast extracts markedly lowers the potential of the iron compound. A phosphorus compound is associated with the above complex."

Spectrophotometric studies.—I, Spectrophotometric constants for common hemoglobin derivatives in human, dog, and rabbit blood, D. L. DRABKIN and J. H. AUSTIN (*Jour. Biol. Chem.*, 98 (1932), No. 2, pp. 719-733, fig. 1).—A simple, reproducible, and adequate inorganic standard (defined concentrations of copper sulfate dissolved in definite concentrations of ammonium hydroxide) to standardize the spectrophotometric technic is suggested; values of the absorption constant, A , for various hemoglobin derivatives in man, rabbit, and dog are presented; a method for the quantitative spectrophotometric estimation of a mixture of two pigments whose A values are known is given; and the danger of excessive dilution of blood for spectrophotometric measurement is demonstrated.

Influence of certain ions upon the extraction of malt amylase from alumina gel by which it has been adsorbed, M. L. CALDWELL and S. E. DOEBBELING (*Jour. Biol. Chem.*, 98 (1932), No. 2, pp. 553-563).—This contribution presents evidence to show that the extraction of malt amylase from alumina gel by which it has been absorbed is greatly influenced by the kind and concentration of anion present in the extracting solution, and it is suggested that this may be correlated with an exchange of active enzyme from the aluminum ion complex for the anions of the electrolyte. In the experiments reported here, the sodium salts being used at 0.10 M concentrations, the order of effectiveness in the extraction of the amylase was the following: Chloride < acetate < oxalate < sulfate < tartrate < citrate < phosphate.

[Chemical analyses at the Hawaii Station] (*Hawaii Sta. Rpt. 1932*, pp. 11, 12).—The chemical report briefly notes determinations of the principal anions and cations of a number of types of starch, by J. C. Ripperton and D. W. Edwards, and analyses for nicotine content of Hawaiian tobaccos, by L. N. Bilger, M. Westgate, and R. Loveland.

The determination of iodide in blood, foods, and urine, E. J. BAUMANN and N. METZGER (*Jour. Biol. Chem.*, 98 (1932), No. 2, pp. 405-416, figs. 2).—A simplified set-up for a combustion in a closed system is described, the authors having found that open combustion, even in the presence of added alkali, resulted in important and irregular losses of iodine.

Combustion is carried out in a balloon flask in a current of oxygen, ignition being effected by an electric heating of a fine platinum wire between chromium steel electrode rods, one of which supports the platinum dish in which the sample is burned. The absorption train is reduced to two Drexel wash bottles between which—replacing the Cottrell precipitator—are connected two small funnels placed mouth to mouth with four layers of fine grained filter paper between them, the whole smoke-filter assembly being sealed gas-tight with paraffin of high melting point.

Such substance as contained too little organic matter to burn well were mixed with small quantities of iodine-free powdered sugar, salicylic acid, or other material rich in carbon.

Effect of microorganisms on the jellying power of fruit juices, C. R. FELLERS, J. A. CLAGUE, and R. L. FRANCE (*Massachusetts Sta. Bul.* 293 (1933), p. 42).—The effect of several species of *Aspergillus* and *Penicillium* in decomposing pectin in fruit juices is noted.

AGRICULTURAL METEOROLOGY

On the research work of the U.S. Weather Bureau, W. J. HUMPHREYS (*Sci. Mo.*, 36 (1933), No. 5, pp. 419-428, figs. 6).—The kinds of meteorological and climatological observations recorded by the U.S. Weather Bureau and the uses made of them in the public service, as well as the basic research done by the Bureau, with special reference to improvement of apparatus and methods, and quality and scope of the service, are briefly explained.

It is pointed out that while the collection and use of accurate data for general and special forms of weather forecasting and the perfecting of the forecast system is one of the chief duties of the Weather Bureau, its investigations cover a wider range than this would imply. For example, the reception and distribution of solar radiation, referred to as perhaps the most fundamental of all meteorological problems, "has led to a multitude of investigations in which the U.S. Weather Bureau has taken a creditable part, and in which it expects to continue to assist so far as practicable."

With regard to the various subjects grouped together under the general name of agricultural meteorology, the author says that "despite the complexity of this subject, investigations already have disentangled from it several helpful generalizations, and more are in sight for whoever has the courage to till this bramble field and is well supplied with the necessary equipment therefor", and he calls attention to frost protection and similar services which have been of great value to agriculture.

Of long range or seasonal forecasting, which "almost everyone seems to want", he says: "It would be a matter of great importance if we could predict the weather with approximate accuracy months in advance, and innumerable attempts have been made to do this. . . . The situation in this connection is at present discouraging, but . . . every rational lead in that direction should and will be followed to its conclusion."

The climates of the earth, C. W. THORNTHWAITTE (*Geogr. Rev.*, 23 (1933), No. 3, pp. 433-440, pl. 1, figs. 2).—A quantitative classification is briefly described and shown on a world map. It is stated that this classification "is like Köppen's in that it is quantitative and attempts to determine the critical climatic limits significant to the distribution of vegetation, and also in that it employs a symbolic nomenclature in designating the climatic types. It differs from Köppen's classification in that it makes use of two new climatic concepts, precipitation effectiveness and temperature efficiency." The map shows 32 different climates distributed over the earth in a very definite pattern.

Insects and micro-climates, H. H. DARBY (*Nature* [London], 131 (1933), No. 3319, p. 839).—Attention is briefly called to variation in transpiration, especially from mango leaves in wet and dry seasons in Morelos, Mexico, and the influence it has on temperature and humidity in small local areas, with particular reference to survival of the Mexican fruit fly.

Climatological data for the United States by sections, [1932] (*U.S. Dept. Agr., Weather Bur. Climat. Data*, 19 (1932), No. 13, pp. [241], pls. 2, figs. 25).—Summaries are given of climatological data for each month of 1932 and for the year as a whole for each State.

SOILS—FERTILIZERS

[Soil investigations of the Massachusetts Station] (*Massachusetts Sta. Bul.* 293 (1933), pp. 12, 13, 14, 46, 47).—Results are briefly noted on the nitrification of castor pomace, soybean meal, peanut-shell meal, and other organic materials, and on the effect of varying proportions of moisture and organic

materials (manure and peat) on soil nitrates, by M. H. Cubbon; nitrogen fixation in the presence of, or as a result of, legumes v. nonlegumes, by J. E. Fuller; the influence of temperature on the nitrate content of soil in the presence of decomposing cellulose, by Fuller and L. H. Jones; the application of the soil-plaque method for determining mineral deficiencies in Massachusetts soils, by Fuller; and nitrogen fixation in the presence or as a result of the growth of legumes v. nonlegumes under certain defined agronomic conditions, by F. W. Morse.

Report of the soil physics division, H. A. WADSWORTH (*Hawaii Sta. Rpt. 1932, p. 22*).—The physical significance of the silica-sesquioxide ratios of soil colloids is briefly discussed.

The classification and evaluation of the soils of western San Diego County, R. E. STORIE (*California Sta. Bul. 552 (1933), pp. 41, figs. 19*).—The four main groups into which the soils of the area in question were divided are thus described: (1) Primary soils formed in place by the weathering of the parent bedrock or substratum on which the soils rest, and occurring on the rolling to mountainous topography east of the coastal plain; (2) unweathered secondary soils formed by deposits of recent alluvial material; (3) slightly to moderately weathered secondary soils derived from alluvial or coastal plain materials, of which the subsoils are slightly or moderately denser and heavier in texture than the surface soils; and (4) weathered secondary soils from old alluvial or coastal plain materials, usually occurring on terraces and having extremely heavy clay subsoils.

“The soils mapped in the El Cajon, Oceanside, and Capistrano detailed soil surveys have been evaluated on a comparative basis designated as the ‘index of soil value’ and expressed as percentage. This rating is based on the soil characteristics which govern their agricultural value, such as the depth, texture, and density of the surface soil and subsoil, reactions, alkali content, and drainage conditions. On the basis of their index values the soils have been graded into six grades—excellent soils, good soils, fair soils, poor soils, very poor soils, and miscellaneous nonagricultural materials.”

Lysimeter studies.—III, The movement and translocation of nitrogen and organic constituents in the profile of a podzolic soil, J. S. JOFFE (*Soil Sci., 35 (1933), No. 5, pp. 401–411*).—A discussion on the data of lysimeter investigations, as exemplified at the New York Cornell, New York State, and Rothamsted stations, on the nitrogen losses from soils is presented, in this third paper (*E.S.R., 69, p. 179*) from the New Jersey Experiment Stations.

The data on the nitrogen in the leachings from the new type of lysimeters show that in forest soils the nitrogen losses are not entirely in the form of nitrates. Only 50 to 75 percent of the nitrogen appears as nitrates through the A_1 horizon and still less through the A_2 horizon.

Only 3.24 lb. of total nitrogen percolated through A_2 in 1929–30 and only 3.09 lb. in 1930–31. “Thus only small amounts of total nitrogen are lost.”

Data on the organic matter content in the leachings show that the type of organic matter varies but slightly within each horizon from year to year. There was, however, a considerable difference between the organic matter in the leachings of the A_1 and A_2 horizons. “The differences in the organic matter from the various horizons are easily noted from the data on the C:N ratios and the nitrogen content of the organic matter. The ratio is high in A_1 and low in A_2 , giving a high nitrogen content to the organic matter in A_2 . This offers a clue to the observed phenomenon of a high nitrogen content in the organic matter of the B horizon. It is pointed out that the scant leachings from B and C prevent the evaluation of the true loss of nitrogen from the soil,

but even if one accepts the losses from A_2 as typical (an assumption not justified) they are small, and the additions of nitrogen by the rain water more than offsets these losses. Appreciable amounts of nitrates are retained by the B horizon, and for this reason the nitrate content in the leachings from C is, as a rule, low."

Influence of crop residue decay on soil nitrates, A. L. PATRICK (*Soil Sci.*, 35 (1933), No. 5, pp. 335-354, figs. 3).—The quantities of roots and stubble left in the soil at harvest time were determined, as were also the effects of additions of various amounts of crop residues to soil, both upon changes in soil nitrate and upon the evolution of carbon dioxide. General plant analyses were also made.

The dry matter residue of the roots and stubble of red clover amounted only to about one half of that left by timothy. Corn left a root and stubble residue very small in comparison with that of the other two crops.

The nitrification studies showed that field quantities of clover and timothy are sufficient to influence the accumulation of soil nitrates. All proportions of timothy residues used resulted in depressing the nitrate content. Clover residues seemed to cause a temporary depression of soil nitrates during the first period of incubation. The corn residues did not affect soil nitrates until the quantity added greatly exceeded that found in the field, except in the immediate vicinity of large root and stubble clumps. "Corn, which caused the least depression of soil nitrates, contained the smallest percentage of organic matter soluble in cold water and the least amount of available energy material. It did not contain the highest percentage of water-soluble nitrogen, but the carbon-nitrogen ratio of the water-soluble portions was narrowest in corn of the three residues."

The evolution of carbon dioxide was found to correlate rather closely with the reduction of the nitrate content of the soil.

The effect of culture solutions on growth and nitrogen fractions of oat plants at different stages of their development, A. C. SESSIONS and J. W. SHIVE (*Soil Sci.*, 35 (1933), No. 5, pp. 355-374, figs. 4).—A contribution from the New Jersey Experiment Stations reports upon experiments with solution cultures of oats in media containing (1) relatively high concentrations of the ammonium ion, (2) relatively high concentrations of the nitrate ion.

"In the younger stages of development, the oat plants grew equally well in the high ammonia and in the high nitrate solutions, but in the later stages of their development the growth of the plants in solutions high in ammonium was much less than that of plants in the high nitrate solutions. Correlated with low dry weight yields of the older plants in the high ammonium solutions was a relatively high yield of nitrogen as ammonia in the plants, and this was the only nitrogen fraction considered which showed higher yields in the older than in the younger plants. The nitrogen as ammonia in the plants was high or low, respectively, with high or low proportions of nitrogen as ammonium in the culture solutions in which the plants were grown. The nitrate nitrogen in the plant was high or low, respectively, with a high or low amount of nitrate nitrogen in the culture solutions in which the plants were grown. The inorganic nitrogen of these plants was largely in the nitrate form. It often represented more than 2 percent of the dry weight of the plants and sometimes comprised more than one third of the total nitrogen. Plants high in soluble organic nitrogen had high ammonia content and were produced by solutions with high relative proportions of nitrogen as ammonium and low proportions of nitrate nitrogen. For plants of a given age, the insoluble organic nitrogen fraction was more constant and less influenced by the chemical composition

of the culture solutions in which the plants were grown than were any of the other nitrogen fractions; but since protein synthesis per gram of tissue was greatly reduced as the plants approached maturity, the insoluble organic nitrogen was more influenced by the age of the plant than was any other fraction. Solutions with high relative proportions of nitrogen as ammonium produced plants which were high in total organic nitrogen and low in inorganic nitrogen, whereas solutions with high relative proportions of nitrate nitrogen produced plants high in inorganic and low in organic forms of nitrogen. The total nitrogen of the plants varied with the total nitrogen of the solutions in which the plants were grown, but not in direct proportion to the amounts appearing in the culture solutions."

AGRICULTURAL BOTANY

The ecotype concept in relation to the registration of crop plants, J. W. GREGOR (*Ann. Appl. Biol.*, 20 (1933), No. 2, pp. 205-219).—The ecotype concept as formulated by Turesson postulates the existence, in the wild, of ecotypes, subspecific units which result from the environmental fractionation of a larger population. Details are given of the occurrence of such units in nature. While wild ecotypes are not strictly comparable with the agricultural crop units, the general principles underlying this concept have a definite agricultural application. A standard system of crop classification which embodies data relating to the environmental preferences of its units is suggested. The two units of agricultural significance discussed are the agrotype, or ultimate crop unit, and the agro-ecotype, or group of agrotypes possessing similar environmental preferences. Measures for the administration of the scheme are outlined.

Mycorrhizas of trees and shrubs, L. K. HENRY (*Bot. Gaz.*, 94 (1933), No. 4, pp. 791-800, figs. 6).—As reported by the Carnegie Museum at Pittsburgh, Pa., mycorrhizas of three types, namely, ectotrophic, endotrophic, and ectendotrophic, were discovered on 60 different trees and shrubs, 26 of which are reported as hosts for the first time.

The amounts and distribution of some phosphorus and nitrogen compounds in wheat during growth, F. KNOWLES and J. E. WATKIN (*Jour. Agr. Sci. [England]*, 22 (1932), No. 4, pp. 755-767, figs. 4).—The lipin, phytin, and inorganic phosphorus and the protein and nonprotein nitrogen present in the wheat plant from 7 weeks before spike emergence until harvest were determined. The relationships between phytin phosphorus and protein nitrogen, and between lipin phosphorus and nonprotein nitrogen, were indicated.

Quantitative relation between chlorophyll and iron in green and chlorotic pear leaves, J. OSERKOWSKY (*Plant Physiol.*, 8 (1933), No. 3, pp. 449-468, figs. 6).—The fact that lime-induced chlorosis is curable by iron treatment suggests the presence of less iron in chlorotic than green leaves. However, in these studies at the University of California it was found that chlorotic pear leaves may contain as much or more iron than do green leaves of the same age taken from the same tree. Green leaves from nonchlorosis regions were higher in iron than were green or chlorotic leaves from affected trees.

No correlation was found between the amount of iron extracted from pear leaves with water or with $N/2$ hydrochloric acid and the chlorophyll content, making evident that only part of the iron, the active part, was effective in chlorophyll formation. A method of estimating the active iron is described, based on the assumption that the iron used in chlorophyll formation is contained in the N hydrochloric acid extract of dried leaves. The fact that the chlorophyll to active iron ratio varies widely in different sets of leaves suggests that the active iron may not be directly combined with chlorophyll.

Stimulative effects of X-rays on plant growth, C. A. SHULL and J. W. MITCHELL (*Plant Physiol.*, 8 (1933), No. 2, pp. 287-296, figs. 4).—Under appropriate conditions of treatment, as the use of metallic screens, high voltage and low amperage, and brief exposures, X-rays seemed to produce stimulative effects upon the growth of wheat, corn, oats, and sunflower seedlings. The total dosage for stimulation did not greatly exceed 100 r-units. Optimum growth occurred with about 115 r-units (3 minutes). There was some evidence of increased sugar content and increased respiration of treated seedlings.

Physiological variations in certain crop plants following seed exposure to high-voltage X-rays, C. N. MOORE and C. P. HASKINS (*Bot. Gaz.*, 94 (1933), No. 4, pp. 801-807, figs. 6).—Aberrations obtained in plants resulting from exposure of seeds of cotton, tung-oil tree, snapdragon, phlox, and sour orange to harder X-ray radiation than has usually been employed in experiments are described. In cotton, extreme fasciation, alterations of leaf forms, and complete dwarfing were noted.

Decreasing hardiness of winter wheat in relation to photosynthesis, defoliation, and winter injury, S. T. DEXTER (*Plant Physiol.*, 8 (1933), No. 2, pp. 297-304, figs. 3).—The decrease in hardiness of winter wheat plants so that they are injured more readily by cold weather is of considerable agronomic importance. Experiments with both hardy and resistant winter wheat varieties furnished evidence that, in general, the maintenance of the hardened condition in winter wheat plants apparently depends upon environmental conditions favoring the conservation of organic food reserves, i.e., which depress respiration and top growth and favor dormancy with continued periods of photosynthesis.

Relation of hydrophilic colloids to hardiness in cabbage, brussels sprouts, and alfalfa plants as shown by the dye adsorption test, S. DUNN (*New Hampshire Sta. Sci. Contrib.* 37 (1933), pp. 275-286, figs. 3).—This is a reprint of a previously noted article (*E.S.R.*, 69, p. 365).

Damage caused by industrial fumes in Imatra State Park [trans. title], E. KANGAS (*Silva Fennica*, No. 23 (1932), pp. 34, pl. 1, figs. 5; *Ger. abs.*, pp. 32-34).—In this park, located in Finland, a wooded area of about 5 ha, consisting chiefly of pine and birch, with some aspen, fir, and alder, exhibited injury from smoke and industrial fumes issuing from an electrochemical plant. Part of the injury was due to chlorine and was expressed in a yellowing and dropping of leaves, especially of pines, so that badly affected trees were nearly defoliated. The injury to pines occurred during the winter when the branches were covered with snow. Trees were damaged within a radius of 300 m. Birches were also damaged so that some failed to leave out in the spring. The injured pines subsequently fell prey to numerous insect pests. Aspens and firs proved decidedly resistant to smoke damage.—(*Courtesy Biol. Abs.*)

GENETICS

Evolution in Mendelian populations, S. WRIGHT (*Genetics*, 16 (1931), No. 2, pp. 97-159, figs. 21).—A mathematical interpretation of the probability array for gene frequencies in populations of limited size under recurrent, reversible, or irreversible mutations, selection, and immigration.

Cytological studies in cotton.—I, The mitosis and meiosis in diploid and triploid Asiatic cotton, A. SKOVSTED (*Mem. Cotton Res. Sta., Trinidad, Ser. A, Genet.*, No. 5 (1933), pp. 227-251, pls. 4, fig. 1).—The cytological studies reported dealt with mitosis and meiosis in a sterile triploid Asiatic cotton and in the diploids *Gossypium arboreum* and *G. herbaceum* × *G. arboreum*.

Cytological and phylogenetic studies in the Cucurbitaceae, T. W. WHITAKER (*Bot. Gaz.*, 94 (1933), No. 4, pp. 780-790, figs. 16).—Chromosome counts

presented for 12 species of cucurbits examined at the University of Virginia showed 6 of the species to have 12 haploid chromosomes. With one exception genera of Old World origin had basic numbers of 11 to 13, and of two New World groups one had 16 chromosomes and the other 20 to 24.

The behavior of a triploid in *Nicotiana tabacum* L., E. M. EAST (*Amer. Jour. Bot.*, 20 (1933), No. 4, pp. 269-289, figs. 7).—The cytological behavior of a triploid plant (H-1) appearing in a culture of *N. tabacum purpurea*, and of member populations raised from seed of the triploid selfed and from a mating of the triploid as female with a normal diploid as male, is described from studies at the Bussey Institution.

Chromosome studies in *Zea mays* L., L. M. HUMPHREY (*Amer. Jour. Bot.*, 20 (1933), No. 4, pp. 290-295, figs. 8).—The typical diploid number of chromosomes in numerous cultures of corn studied was 20, except in Emerson's A-tester where the number was constantly 22 diploid and 11 haploid without morphological peculiarities. One plant with 26 diploids was observed in Bantam Evergreen; in this plant there appeared to be more short chromosomes than in the normal complement. Relative lengths and thicknesses of the chromosomes seemed to be quite constant within cultures.

Studies in Indian chillies.—III, The inheritance of some characters in *Capsicum annuum* L., R. B. DESHPANDE (*Indian Jour. Agr. Sci.*, 3 (1933), No. 2, pp. 219-300, pls. 6, figs. 8).—The progeny of crosses between two sharply contrasting types of chili, one with purple corolla and short, globular red fruits, and the other with white corolla and elongated orange fruits, are analyzed with respect to type of inheritance. Among characters inherited on a monofactorial basis are fruit position, color of the ripe fruit, type of fruit apex, and thickness of the fruit. Weak linkage was observed between color in the plant and color of the ripe fruit, and strong linkage between the character of the fruit base and that of the calyx, between pedicel length and color of the plant, and between petal length and color of the plant. Length of fruit is believed inherited on a trihybrid basis. Heterosis was manifested in the F_1 generation with respect to vigor, height, productivity, time of maturity, and thickness of the fruits.

The inheritance of virescent yellow and red plant colors in cotton, D. T. KILLOUGH and W. R. HORLACHER (*Genetics*, 18 (1933), No. 4, pp. 329-334).—Virescent yellow cotton, a new type studied at the Texas Experiment Station, is greenish yellow when young, but the chlorophyll gradually increases in amount so that the mature plants are not readily distinguishable from normal green plants. Virescent yellow (v) is a simple recessive to green (V). Red leaf (R), produced by the distribution of anthocyanin pigment throughout the plant, appeared to be a simple dominant to green leaf (r), confirming results of others. R and V are inherited independently. R in combination with v resulted in a new type termed bronze.

Reaction of varieties and hybrids of wheat to physiologic forms of bunt, E. F. GAINES and W. K. SMITH (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 4, pp. 273-284, figs. 2).—In a cooperative study by the Washington Experiment Station and the U.S. Department of Agriculture, 11 fall-sown and 15 spring wheats were used in differentiating five physiologic forms of *Tilletia tritici* and at least two forms of *T. laevis* obtained from collections of bunt made in the Pacific Northwest. The reactions of 27 winter wheats, including the more important commercial varieties of this area, to single cultures and mixtures of these forms are described.

Hohenheimer is highly resistant to physiologic forms T2 and L4, to which White Odessa is quite susceptible, and both of these varieties of winter wheat

are moderately resistant to T11. The seed obtained from each F₂ plant of Hohenheimer × White Odessa was divided into three parts, one part being inoculated with T2, another with T4, and the third with T11. Indications were that the factor in Hohenheimer for strong resistance to T2 is responsible for strong resistance to L4, and also induces the moderate resistance of Hohenheimer to T11. In reaction of progenies to T11, transgressive segregation was observed, some progenies being much more resistant and some much more susceptible than either parent. A single main factor, different from the factor for resistance in Hohenheimer, seemed to determine the moderate resistance of White Odessa to T11.

New results on the inheritance of blood groups in domestic animals [trans. title], S. SCHERMER and A. KAEMPFFER (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol.*, 24 (1932), No. 1, pp. 103-109).—A review is given of information on the inheritance of blood groups in horses, sheep, and swine, with additional data on 214 pedigrees of swine. These data confirm previous findings of a single blood factor A and its agglutinin α , making three blood groups, Ao, O α , Oo. A was dominant over O, but they were not located in the same chromosome.

How must one breed to determine the natural or experimental mutation rate in mammals? [trans. title] P. HERTWIG (*Arch. Rassen u. Gesell. Biol.*, 27 (1932), No. 1, pp. 1-12, fig. 1).—This is a theoretical discussion of the numbers of animals which must be produced to demonstrate the occurrence of recessive mutations by different breeding methods when pure stocks have been established which may be used in such a study.

The "pied" and "splashed white" patterns in horses and ponies, V. KLEMOLA (*Jour. Heredity*, 24 (1933), No. 2, pp. 65-69, figs. 4).—A briefer synopsis in English of the studies previously noted (E.S.R., 66, p. 728) on the inheritance of the dominant and recessive piebald patterns and wall eyes in horses.

On the question of sex inheritance in horses. (On a lethal sex-linked gene in horses) [trans. title], D. KISSLOWSKY (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol.*, 24 (1932), No. 2, pp. 269-279).—Data are reported on the sex ratio of the offspring produced by related mares. In general, the mares produced twice as many fillies as stallion foals. The explanation of this result is based on the occurrence of a sex-linked lethal recessive gene transmitted by the female to half of her sons and half of her daughters, but operating in the males because of the single X chromosome.

The sex ratio and multiple births in cattle, I. JOHANSSON (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol.*, 24 (1932), No. 2, pp. 183-268, figs. 11; *Ger. abs.*, pp. 258-263).—Data are reported from the Wisconsin Experiment Station on the sex ratios and occurrence of multiple births in 152,576 births in Swedish Red and White Cattle, Swedish Friesians, Swedish Landraces, Finnish Ayrshires, and East and West Finnish Landraces.

The secondary sex ratios of singles were very similar to the average for all breeds, 51.52 ± 0.142 percent males in each of the first four breeds. The percentage of males showed a slight increase after the third parity, which is attributed to a lessened occurrence of abortions and prenatal mortality. A lower percentage of bull calves was produced by sires between the ages of 5 and 9 years than by younger or older sires. There was no indication of the operation of hereditary factors to modify significantly the sex ratio of the offspring of a sire or dam. Season had no significant influence on the sex ratio.

The sex ratios of twin and triplet births were lower than in singles, suggesting a heavier mortality of male embryos than of females. The data showed a higher mortality and lower average in multiple births than in singles.

Multiple pregnancy differed with the breeds, there being 3.35 percent of twin births in the Swedish Friesians as compared with 1.8 percent in the Swedish Red and White Cattle and Swedish Landraces. The questioned occurrence of monozygotic twinning in cattle is answered in the affirmative from corpora lutea counts and the occurrence of conjoined twins. Age of the dam and season of the year played important roles in twinning, which increased up to from 8 to 9 years and was high in June-July and December-January births. Quantity rather than quality of feed seemed to be more closely related to multiple ovulation. A hereditary basis for multiple births in cattle was suggested by the differences in the recurrence of multiple births a second and third time to the same dam and in daughters of twin-producing parents.

[Breeding experiments with poultry in Massachusetts] (*Massachusetts Sta. Bul.* 293 (1933), pp. 54, 55, 56).—Data are given in connection with studies on broodiness in poultry, factors affecting egg weight and shell character in domestic fowl, a genetic study of color in Rhode Island Reds, and determination of genetic laws governing inbreeding, all by F. A. Hays, and breeding poultry for egg production, by Hays and R. Sanborn.

Inbreeding and intercrossing in poultry, M. A. JULL (*Jour. Heredity*, 24 (1933), No. 3, pp. 93-101, figs. 2).—A study conducted by the U.S.D.A. Bureau of Animal Industry on inbreeding White Leghorn fowls is reported.

Inbreeding by brother \times sister and half-brother \times half-sister for three years resulted in a decrease in the hatchability of the fertile eggs, the rate of sexual maturity, and egg production. The fertility of the eggs and the viability of the chicks were not materially affected. When the inbred lines were intercrossed, hatchability of the eggs, viability of the chicks, rate of maturity, and egg production were significantly increased. An unexpected result from the crossing was a decrease in fertility.

Spurlessness of the White Leghorn, A. W. KOZELKA (*Jour. Heredity*, 24 (1933), No. 2, pp. 71-78, figs. 2).—Three spurless chicks from a strain of White Leghorns exhibiting considerable variability in spur development were used as the foundation stock for the study. Crosses of these birds with normals produced only normally spurred birds. Inter se matings of F_1 s produced 102 spurred and 36 spurless birds. Back-crossing the hybrids to spurless individuals produced 28 spurred and 32 spurless young. Some variations in the development of the spurs were noted.

It is concluded that the spurless character is inherited as a single recessive, but that modifying factors affect the degree of spur development. The spurless condition is due to the failure of the integumental portion of the spur to develop and is apparently associated with a reduced vitality.

A two-faced kitten, T. H. BISSENETTE (*Jour. Heredity*, 24 (1933), No. 3, pp. 102-104, figs. 2).—A kitten with a single head and a pair of ears, but with double face characters, is described.

The furless rabbit, W. E. CASTLE (*Jour. Heredity*, 24 (1933), No. 3, pp. 80-86, fig. 1).—The results of a study of the linkage relations of the furless character in rabbits, due to a single recessive gene, to other characters are reported. This character did not appear to be linked with the genes for agouti, brown, dilute, yellow, English, rex, kurzhaar, or Vienna white. Its relation to the blood group genes is still to be determined.

A case of superfetation in the waltzing mouse, W. H. GATES (*Jour. Heredity*, 24 (1933), No. 3, pp. 111, 112).—A case of superfetation in the mouse is noted, in which a litter of three normal young were born on August 23 and three more normal young on September 1 to the same dam.

Artificial control of sex in the progeny of mammals, N. K. KOLTZOFF and V. N. SCHRÖDER (*Nature [London]*, 131 (1933), No. 3305, p. 329).—An attempt was made to separate the male- and female-producing sperm of rabbits by cataphoresis. Six female young were produced by a female inseminated with sperm from the anode, 4 males and 1 female by a female inseminated with sperm from the cathode, and 2 males and 2 females by a female inseminated with sperm from between the two poles.

Russian methods of artificial insemination multiply sires' value, W. LANDAUER (*Jour. Heredity*, 24 (1933), No. 3, pp. 87-92, figs. 2).—Methods employed in artificial insemination of animals in general and sheep in particular in Russia are described.

Luteinization of ovary of sexually immature monkey, F. L. HISAW, R. HERTZ, A. HELLBAUM, and H. L. FEVOLD (*Soc. Expt. Biol. and Med. Proc.*, 30 (1932), No. 1, pp. 39-41).—The daily intravenous administration of 2-g equivalents of a pituitary preparation from sheep containing both the follicular stimulating and luteinizing hormones to immature monkeys was found to cause marked luteinization in the ovaries after 8 days in one, and less complete luteinization in the other after 3 days.

The relation of pregnancy cells in the pituitary of the rat to the reproductive cycle, H. O. HATERIUS (*Anat. Rec.*, 54 (1932), No. 3, pp. 343-353, pl. 1).—Results of a study are reported of the anterior lobe of the hypophysis of female rats at different stages of pregnancy and pseudopregnancy, postpartum animals sacrificed throughout lactation, and females from which the litters were prematurely removed. The studies showed that pregnancy changes were exhibited in the gland of pregnant and pseudopregnant animals at from 2 to 4 days following copulation by an increased vascularity, the presence of small scattered cells with large compact nuclei, and small amounts of clear eosin-stained cytoplasm which was very finely granulated. These changes were increasingly marked until the twelfth day of gestation, after which no discernible change was noted until lactation ceased.

It is suggested that the presence of luteal tissue in the ovary was closely associated with the production of the pregnancy cells of the hypophysis.

Delayed pregnancy in mice, E. V. ENZMANN, N. R. SAPHIR, and G. PINCUS (*Anat. Rec.*, 54 (1932), No. 3, pp. 325-341, pl. 1, figs. 3).—The authors report that in delayed pregnancy in mice resulting from suckling a previous litter there is a failure of the blastodermic vesicles to become implanted at the normal time—the sixth day after mating. Delayed implantation, which may occur as late as the sixteenth day after mating, was related to the number of young suckled, the delay being about 21 hours per individual in the suckling litter. Blastocysts delayed in implantation showed practically no development, but the normal rate of development followed implantation.

The study was based on three groups of females, one of which was kept continuously with males and the other two were isolated when pregnancy was established and mated after parturition. The females in one of the latter groups were killed and examined for the presence of free blastocysts and implanted embryos at different intervals following copulation.

Living rat eggs, F. GILCHRIST and G. PINCUS (*Anat. Rec.*, 54 (1932), No. 2, pp. 275-287, pl. 1).—The results of a study of fertilized and nonfertilized ova recovered from the fallopian tubes at intervals up to 95 hours after copulation are described. In the rat ovulation may occur as early as 8½ hours after copulation and, if unfertilized, ova remain in the fallopian tubes at least 23 hours after copulation. Cleavage of fertilized eggs begins at from 27 to 48 hours after copulation. Little change in size occurs during the first three cleavages.

Follicle cells adhered to the unfertilized eggs, but these were dispersed in the presence of living sperm in vitro. There was a shrinkage of about 13 to 17 percent in the size of the ovary on fertilization.

Effects of the introduction of blood from bred rabbits upon immature rabbits, C. DUMONT, F. E. D'AMOUR, and R. G. GUSTAVSON (*Soc. Expt. Biol. and Med. Proc.*, 30 (1932), No. 1, pp. 68, 69).—Intravenous injections into immature female rabbits of from 20 to 60 cc of blood serum from rabbits bled from 1½ to 12 hours after coitus induced the formation of large corpora hemorrhagica or corpora lutea in many of the test animals used, but negative results were obtained from blood of unbred females or males, urine from bred animals at from 8 to 12 hours post-coitum, and extracts of blood serum precipitated with sodium sulfate. These results are interpreted as supporting the theory that ovulation in the rabbit results from an increased production of the hormone of the anterior lobe of the pituitary.

Gonadotropic action of phyone on juvenile female rabbit, R. HERTZ, A. HELLBAUM, and F. L. HISAW (*Soc. Expt. Biol. and Med. Proc.*, 30 (1932), No. 1, pp. 41, 42).—Marked follicular enlargement and extensive luteinization were induced in immature rabbits by intravenous injections of 5 cc of phyone, a growth-promoting extract of fresh beef pituitary tissue, on from 3 to 5 successive days.

The phyone was without effect on the ovaries of sexually immature rats.

Anterior pituitary therapy and uterine motility in the unanesthetized rabbit, S. R. M. REYNOLDS (*Soc. Expt. Biol. and Med. Proc.*, 30 (1932), No. 1, pp. 59–61).—A decrease in the spontaneous motility of the uterus of castrated and normal female rabbits followed within from 5 to 7 hours the administration of fresh alkaline and saline extracts of beef anterior pituitaries. Boiled extracts were not effective.

FIELD CROPS

[**Field crops work in Hawaii**], C. P. WILSIE, M. TAKAHASHI, J. C. RIPPERTON, D. W. EDWARDS, and H. F. WILLEY (*Hawaii Sta. Rpt. 1932*, pp. 3–6, 11, 22, fig. 1).—Brief progress reports are made on breeding work with pigeon peas; variety tests with green manures, soybeans, garden beans, head lettuce, corn, and sweetpotatoes; trials of miscellaneous forage grasses and legumes; and composition of grasses variously fertilized.

[**Field crops work in Maryland**] (*Maryland Sta. Rpt. 1932*, pp. X–XII).—Brief notes are given on variety tests with alfalfa, wheat, and sweet corn and on improved sorts of winter wheat, barley, and sweet corn.

[**Field crops research in Massachusetts**], A. B. BEAUMONT, E. F. GASKILL, J. L. HADDOCK, M. C. DARNELL, M. E. SNELL, W. S. EISENMENGER, W. J. MOORE, L. S. DICKINSON, E. B. HOLLAND, and E. BENNETT (*Massachusetts Sta. Bul. 293* (1933), pp. 8, 9, 10–12, 13, 45, 46).—Experiments with field crops reported on again (*E.S.R.*, 67, p. 378) in summary form comprised variety trials with alfalfa, red clover, fall- and spring-sown vetch, field peas, and soybeans; the magnesium requirements of field crops; and forage crops work including pasture studies, top-dressing meadows with different complete fertilizers and different nitrogen carriers, study of assimilation of fixed nitrogen by grasses and clovers, and fertilizer tests on fine turf grasses. Research with tobacco was concerned with cropping systems, nitrogen carriers, proportion of organic : inorganic nitrogen in the fertilizer, methods of applying fertilizers, effects of fertilizer and cultural treatment on the composition of Havana tobacco, distribution of nitrogen in the plant, and toxicity of aluminum for tobacco.

[Forage crops investigations in Wales] (*Welsh Jour. Agr.*, 9 (1933), pp. 93-223, figs. 5).—Research with different forage crops, meadows, and pastures (E.S.R., 68, p. 319), reported on from different institutions in Wales, is summarized in articles entitled A Comparison of the Nitrogen and Mineral Content of the Pasture, Hay, and Aftermath of Four Species of Grasses Grown in a Mixture, Pure Plots, and Pure Drills, by T. W. Fagan and W. E. J. Milton (pp. 93-109); Note on the Mineral Content of Some Typical North Wales Pastures, by W. G. D. Walters (pp. 109-115); Natural Crossing in Oats, by E. T. Jones (pp. 115-132); Manuring of Red Clover for Seed Production, by J. L. John (pp. 132-135); Manuring Red Clover for Seed (pp. 135-141) and The Influence of Italian Rye-Grass on Barley (pp. 142-145), both by G. Evans; Deficiency of the Clover Nodule Organism on Some Welsh Soils, by A. A. Poulter (pp. 145-159); The Effect of Varying the Period of Rest in Rotational Grazing, by L. I. Jones (pp. 159-170); The Effect of Milling on Sainfoin Seed, by J. Rees (pp. 170-175); The Effect of a Nurse Crop on the Establishment and First Year Yields of Various Grasses and Clovers when Sown in Pure Plots and in Mixtures (pp. 176-190) and Sulphate of Ammonia Compared with Nitro-Chalk as a Nitrogenous Fertilizer on an Open Hill *Molinia* Pasture (pp. 191-195), both by T. E. Jones; The Distribution of Wild White Clover (*Trifolium repens*) in Relation to the Activity of Earthworms (Lumbricidae), by G. H. Bates (pp. 195-208); and The Value of Field Trials with Swedes, by T. Whitehead (pp. 208-223).

Feed grains and forage (*U.S. Dept. Agr. Yearbook 1933*, pp. 171-218, figs. 10).—Articles briefly reviewing the production of feed grains and forage in the United States during recent years include Feed Crops Since 1929 Worth Relatively More Than the Cash Grains, by C. M. Purves, F. J. Hosking, and C. L. Harlan (pp. 171-179); Feeding Experiments With Cereal Grains Indicate Ways of Profitable Use, by A. T. Semple (pp. 179-181); Corn Hybrids Result From Crossing Carefully Selected Parent Lines, by F. D. Richey (pp. 182-190); Barley Acreage Is Increasing Because of Crop Feed Value, by H. V. Harlan (pp. 190, 191); Oat Varieties Have Regional Adaptation, Remain Major Crop, by T. R. Stanton (pp. 191-195); Grain Sorghums Highly Drought Resistant, Many Varieties Grown in U.S., by J. H. Martin (pp. 195-198); Soybeans Now a Major Crop in United States, Few Grown Before 1898, by W. J. Morse (pp. 198-205); Pasture Experiments Point Way to More Profitable Grazing, by H. N. Vinall, C. R. Enlow, and A. T. Semple (pp. 205-212); Alfalfa Losses From Bacterial Wilt Heavy, Resistant Kind Sought, by H. L. Westover (pp. 212-216); and Hundreds of Different Kinds of Insects Attack Feed and Forage Crops, by W. H. Larrimer (pp. 216-218).

Influence of leaf destruction by sulphur dioxide and by clipping on yield of alfalfa, G. R. HILL, JR., and M. D. THOMAS (*Plant Physiol.*, 8 (1933), No. 2, pp. 223-245, figs. 6).—The acute type of sulfur dioxide lesions on alfalfa shows characteristic bleached interveinal and marginal areas in leaves of otherwise normal appearance, while the chlorotic type exhibits a more or less yellowed and mottled appearance and resembles chlorosis due to other causes.

The reduction in yield of alfalfa subjected to a single sulfur dioxide fumigation of one crop, in experiments by the American Smelting and Refining Company at Salt Lake City, Utah, was in direct proportion to the percentage of leaf area destroyed. The growth stage at which fumigation occurs did not seem to influence the result, at least within the range of from 25 to 75 percent of the plant's total growth period. With several fumigations, at least a week apart, each producing the same percentage of leaf destruction, the reduction in yield was also in proportion to the number of fumigations. Reduction in

yield was not a linear function of the number of leaves marked, indicating that uninjured portions of the leaves continue to function. The gas did not seem to reduce the yield unless it produced visible effects.

Reductions of yield due to sulfur dioxide fumigation could be duplicated closely by clipping from normal plants leaf tissue equivalent in area to that destroyed by fumigation. Like acute markings, the chlorotic markings seemed to lower the yield in direct proportion to the percentage of leaf tissue visibly affected. Severe defoliation, either by fumigation or by clipping, which lowered the yield extensively also appreciably reduced the yield of the next untreated crop. Subsequent growth of new leaves and elongation of the stems after a partial defoliation seemed to proceed at the same rate, regardless of whether leaf destruction was by either fumigation or cutting.

A preliminary investigation of the development of structural constituents in the barley plant, A. G. NORMAN (*Jour. Agr. Sci. [England]*, 23 (1933), No. 2, pp. 216-227, figs. 3).—Standwell barley plants were harvested weekly during the season at Rothamsted (April 16 to July 30), growth was measured, and the dried material variously analyzed.

Ash and protein both showed an initial increase, followed by a steady fall as development proceeded. The Cross and Bevan (E.S.R., 39, p. 614) cellulose fraction, i.e., the natural cellulosic fabric of the plant, increased from 30 to 53 percent, showing an initial peak and later a stationary period. The cellulosan (or associated polysaccharide) content in the cellulose increased with development, and markedly after the point at which growth increments lessened. Lignin rose steadily until the last week or so, the fall then probably being due to the increased weight of the grain with respect to the straw. The amount of pentose present was irregular, but was lower in the mature plant than in the young, although the total pentose material in the plant increased.

The taxonomy and morphology of bulbous bluegrass, *Poa bulbosa vivipara*, M. HALPERIN (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 6, pp. 408-413, figs. 3).—*P. bulbosa vivipara* is described in detail, with remarks on nomenclature, and on proliferation and the bulblets in *P. bulbosa*.

Cotton (*U.S. Dept. Agr. Yearbook 1933*, pp. 97-138, figs. 8).—Recent economic and technical developments in the cotton industry are reviewed in brief articles entitled American Cotton Holds Ground Despite Growth of Foreign Competition, by L. Myers, L. D. Howell, and B. H. Thibodeaux (pp. 97-107); Multiplicity of Varieties Handicaps Improvement in the American Cotton Crop (pp. 107-114) and Live-at-Home Plans and Soil Building Aid Cotton Growers (pp. 114-118), both by C. B. Doyle; Fertilizer Composition and Placement Play Big Part in Cotton Growing, by J. J. Skinner (pp. 118-121); Cotton Diseases Take Two Million Bales of U.S. Crop Annually, by D. C. Neal (pp. 121-125); Culture, Insecticides, and Quarantines Help Control Cotton Pests, by R. W. Harned (pp. 126-132); and One-Variety Community Plan Shows Numerous Practical Advantages, by O. F. Cook and C. B. Doyle (pp. 132-138).

Budding and grafting trials with cotton and related plants, R. E. BECKETT (*U.S. Dept. Agr. Circ. 267* (1933), pp. 15, figs. 7).—In budding and grafting trials near Bard, Calif., widely different species of *Gossypium* were united successfully by these methods, and related genera also could be budded and grafted with species of *Gossypium*. *G. sturti* was budded successfully on *G. davidsoni* and *G. arboreum*, and inarched with upland types of cotton from Lower California and Siam. *Thurberia thespesioides* was budded on *G. arboreum* and *G. calycotum*. *Paritium tiliaceum* was inarched with *G. davidsoni*, *Gossypium* species of upland cotton from Mexico, and *Thurberia thespesioides*. *Thespesia populnea* was inarched with *G. sturti* and *G. morrilli*, and *Eriozylum aridum*

was budded on *G. arboreum*. Eight of 21 budding trials and 11 of 15 inarch grafts were successful.

The effect of latitude, length of growing season, and place of origin of seed on the yield of cotton varieties, G. A. HALE (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 8, pp. 731-737, fig. 1).—In a study made at the Georgia Experiment Station, the relative yield of all cotton varieties tested at 37 places in 10 States of the Cotton Belt was correlated with the differences in latitude, and in the annual number of frost-free days at each test location, and at the place of origin of the seed of each variety. A correlation coefficient of -0.143 was found between relative yield and differences in latitude, and one of -0.118 between relative yield and differences in number of frost-free days. Comparison of the average yield of all introduced or named varieties and the yield of locally grown seed in 68 tests in 4 States showed that local or unnamed seed outyielded the varieties in 60.3 percent of the tests.

Effects of sulphuric-acid delinting of cotton seeds, A. H. BROWN (*Bot. Gaz.*, 94 (1933), No. 4, pp. 755-770, figs. 4).—Delinting the seeds of six varieties of cotton, widely grown in Oklahoma, with sulfuric acid before planting gave a higher percentage and increased rate of germination, and the embryo was not injured provided the treatment was not prolonged. The optimum duration of the process was 5 minutes for long staple upland cottons, and could be extended to 20 minutes without injury to short staple seeds. Mature plants derived from delinted seeds outyielded those from undelinted by an average of 21.4 percent.

The culture of sea island cotton in Puerto Rico [trans. title], J. P. RODRÍGUEZ (*Puerto Rico Dept. Agr. and Com. Sta. Circ. 102* (1933), Spanish ed., pp. 33, pl. 1, figs. 16).—Cultural and field practices and irrigation and harvesting methods are indicated for growing sea island cotton in Puerto Rico. Information is also given on seed selection, control of insect pests and diseases, the cotton zones of the island, and statistics on production and commercial movement of the crop.

Some physiological factors influencing the production of flax fiber cells, B. B. ROBINSON (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 5, pp. 312-328, figs. 6).—The morphological characteristics of fiber cells of flax grown under different conditions were studied with material from water cultures grown in the greenhouse and from plants field-grown in replicated plats.

Flax plants were observed to attain their greatest height eventually in short periods (10 hours) of light per day, but to elongate and mature the quickest in long periods (18 hours) of light per day. Short-day plants yielded 8 times as much fiber as the long-day plants. The height of a flax plant largely determines its fiber content. A complete nutrient solution was necessary in water cultures to produce the tallest seedlings. Nitrogen, particularly in combination with other elements, produced the longest stems in field-grown seedling plants, but plants fertilized with phosphorus and potassium equaled or surpassed the nitrogen plats at maturity. Combinations of potassium and nitrogen seemed desirable for best results. Seedling field-grown plants made the highest percentages of fiber with the 4-0-0, 4-16-0, 4-16-8 fertilizer treatments. The percentage of fiber in mature field-grown plants was twice as great as in seedling plants.

Photomicrographs from seedling flax stems proved that the flax fiber cells arise from the pericycle. The number of fiber cells increased after seedling plants were 6 weeks old. The number of fiber cells in field-grown seedling plants increased with additions of fertilizers, but no significant increase or decrease was obtained in mature stems for any fertilizer treatment compared with the check. The area of fiber cells, as seen in cross section, is closely cor-

related with the area of stem, and fertilizers tending to increase the area of stem and probably the number of fiber cells will increase the area of fiber cells.

Water cultures producing the best fiber yields were high in phosphorus and medium high in potassium. The 0-16-8, 4-16-8, 8-16-8, and 4-16-16 treatments gave the largest yields of fiber in cubic millimeters per stem for seedling field-grown flax plants, and the 4-0-8, CaCO_3 6,000 lb., 0-0-0, and 0-0-8 treatments for mature field-grown plants. A fertilizer analysis closely approximating 4-16-8 appeared most desirable for fiber flax where the soil requirements are little known.

A statistical examination of the yield of mangolds from Barnfield at Rothamsted, R. J. KALAMKAR (*Jour. Agr. Sci. [England]*, 23 (1933), No. 2, pp. 161-175, figs. 6).—Series of yields (root weight) of 25 plats of the Barnfield mangel field at Rothamsted, covering the period 1876-1930, were analyzed statistically into components representing deterioration, other slow changes, and annual fluctuations, to determine the relationship between fertilization, mean yield, and variability of the yields.

Jersey Redskin: A fall-crop Irish potato, B. D. DRAIN (*Tennessee Sta. Bul.* 148 (1933), pp. 10, figs. 5).—The Jersey Redskin potato, suggested for the fall crop, sprouted well in late June and early July plantings, made large, vigorous, leafy growth during hot, dry weather, and in six consecutive seasons equaled or surpassed other varieties compared with it. Its vines are seldom injured by late blight, and it has been comparatively free from serious diseases during the station tests. Local seed, if carefully selected, appeared as good as any currently obtainable.

The effect of potash on starch in potatoes, G. V. C. HOUGHLAND and J. A. SCHRICKER (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 5, pp. 334-340).—In analyses of starch made by the U.S. Department of Agriculture on samples of potatoes taken from potash experiments located at Onley, Va., in cooperation with the Virginia Truck Experiment Station, and at Arlington, Va., averages of three years' results did not show significant increases in the starch percentage induced by complete fertilizers containing as much as 10 percent of potash. When average analyses of tubers from potash-treated and from no-potash plats for early and late crops were compared, potatoes grown on the potash-treated plats did not have significant increases in starch percentage. In most cases potash additions to the fertilizer slightly depressed starch percentage. Potassium chloride seemed to have a greater effect than potassium sulfate. Likewise, the potash additions depressed the percentage of dry matter. The three years' averages of the total starch yield produced at Onley did not show a single increase from potash applications with odds of from 30:1, and at Arlington only the 6-8-4 and 6-8-10 treatments with potassium sulfate gave increases in total starch with odds of from more than 30:1.

Results of more than 300 starch analyses of potatoes grown on soil treated with fertilizer lacking potash and subjected to potash treatment varying in quantity and source did not suggest much possibility of regulating to any great extent the starch percentage in potato tubers through alternating the quantity of available potash. In view of marked differences in color and growth of the vines on the potash-treated and no-potash plats, the relation between potash and starch formation might well be subjected to critical study before the actual effect of potash can be determined fully.

Symptoms of fertilizer injury to potatoes, J. BUSHNELL (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 6, pp. 397-407, figs. 5).—When fertilizer was placed closely to Russet Rural potato sets or to small, whole seed tubers in a silt loam soil at the Ohio Experiment Station, several distinct effects were observed.

The most common detrimental effect was the retardation of sprout growth without other visible injury to the seed, sprouts, or roots. The normal absorption of soil moisture by wilted seed tubers was impeded. Under drought conditions, fertilizer in a band above the seed killed or injured some of the sprouts where they encountered the fertilizer. Fertilizer in contact with freshly cut seed prevented normal healing, apparently withdrawing water from the cut surface and destroying a part of the set. Many sprouts were slender, typical of those from inadequate sets, but small, whole seed tubers escaped this type of injury. All of these effects were deemed to be primarily osmotic rather than specific chemical effects. The more soluble the fertilizer used, the larger the application, and the drier the soil, the more serious was the injury.

Spraying and dusting potatoes in Michigan, H. C. MOORE and E. J. WHEELER (*Michigan Sta. Spec. Bul.* 234 (1933), pp. 23, figs. 11).—Recent experiments for the control of potato diseases and insects are reported on, with recommendations for mixing and applying dusts and sprays and for the control of the most common insects and diseases affecting the foliage.

Spraying with Bordeaux increased yields on 22 potato farms by an average of 38 bu. (U.S. No. 1) potatoes per acre in tests in 1927 and 1928. Plats sprayed with Bordeaux outyielded plats treated with copper-lime dust by 13.7 bu. for Russet Rural and by 20.86 bu. for Irish Cobblers in six years' experiments, and dusted plats exceeded check plats by 13 and 10.41 bu., respectively. Increases in yield from spraying and dusting generally were greatest when leafhoppers were most serious. Gains from spraying and dusting appeared to be affected little by weather conditions.

Bordeaux spray cost \$3.70 per acre less than dusting with copper-lime dust. Home-mixed dust was cheaper by \$1.41 per acre per application and as effective as factory-mixed dust. Significant differences in yield were not obtained in comparisons of hand, traction, and power dusting outfits. Dust applications of 30 lb. per acre proved better than lighter applications in a test at Lake City. Hydrated lime equaled quick lime in making Bordeaux, and it is easily obtained and prepared. Instant and standard Bordeaux gave equally good results during three years. A pressure of 300 lb. proved better than 150 or 450 lb. in two years' tests.

Commercial potato production in West Virginia, K. C. WESTOVER (*West Virginia Sta. Circ.* 63 (1933), pp. 28, figs. 13).—Practical information is given on the climatic and soil needs of potatoes; their place in the cropping system; varieties; seed and its preparation; cultural and field practices involved in growing the crop; and harvesting, grading, and storage methods. The status of the industry in West Virginia is reviewed.

The use of cyanamide as a source of nitrogen for sugar cane in Louisiana, A. K. SMITH, JR. (*Louisiana Stas. Bul.* 237 (1933), pp. 24, fig. 1).—Sugar-cane grown in cooperative tests on the several soil types of the Louisiana sugar-cane district differed in its response to nitrogen and phosphorus applied as calcium cyanamide, ammonium phosphate, and superphosphate. First-year stubble usually showed residual effects of fertilizer applied to plant cane.

Plant cane on fertile Mississippi alluvium first bottom soils did not respond to fertilizers, but profitable returns were had from both nitrogen and phosphorus on run-down soils of this type. First- and second-year stubble responded markedly to from 200 to 300 lb. of cyanamide per acre. Fall applications of cyanamide on these soils before planting gave no material gains over spring treatment. About April 18 seemed to be the most advantageous time to apply cyanamide.

On coastal prairie sedimentary soils the use of nitrogen and phosphorus gave very profitable increases with plant cane, while first-year stubble made profit-

able returns with 200 lb. of cyanamide and 200 lb. of superphosphate. On Mississippi-Red River sedimentary soils, plant cane produced profitable increases with 100 lb. of cyanamide, first-year stubble cane with from 200 to 300 lb. of cyanamide, and second-year stubble with 300 lb. of cyanamide. Definite need for phosphoric acid was shown in some cases.

Research on various phases of the use of cyanamide as a fertilizer, particularly for sugarcane, is reviewed briefly.

The method of sampling swede bulbs by cores, V. McM. DAVEY (*Jour. Agr. Sci. [England]*, 22 (1932), No. 4, pp. 767-782, figs. 7).—A series of experiments at the Scottish Plant Breeding Station were made to determine the error likely to occur through deflections from diagonal and horizontal coring alignments in sampling swedes. The coefficient of variability was estimated as about 1 percent of the dry-matter value for either method. In dry-matter value of horizontal cores, diagonal cores, and whole bulbs, the relationship was found to approximate 95:97:100, respectively. Little difference was noted in the accuracy between the coring methods, the horizontal coring being used more easily in practice. Cores including the vascular tissue supplying side roots did not differ much from other cores on the same horizontal plane. Differences in concentration also were examined along a horizontal core passing north and south through the center of the bulb.

Relative influence of nitrate and ammoniacal nitrogen upon intake of calcium by tobacco plants, H. G. M. JACOBSON and T. R. SWANBACK (*Plant Physiol.*, 8 (1933), No. 2, pp. 340-342).—When tobacco was grown in sand and water cultures with varying combinations of nitrate nitrogen (calcium nitrate) and ammoniacal nitrogen (ammonium sulfate), and with equal amounts of the most essential elements, at the Connecticut State Experiment Station, the calcium intake by the plant was increased in direct proportion to increments of nitrate nitrogen over ammoniacal nitrogen supplied in the nutrient solutions. Solutions with the higher proportions of nitrate nitrogen were superior in growth and total production, and a form of root rot increased in severity toward the ammonia end.

Effects of chlorine, bromine, and fluorine on the tobacco plant, L. B. WILSON (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 10, pp. 889-899, figs. 4).—Anatomical studies of leaves from normal tobacco plants compared with leaves from plants receiving certain chlorides, bromides, or fluorides, made by the U.S. Department of Agriculture cooperating with the North Carolina Department of Agriculture, showed that chlorine, bromine, and fluorine caused the leaves to become thickened by enlargement of the leaf cells. When the concentration of halides was maintained at about the limit of tolerance, chlorine caused greater enlargement than did bromine or fluorine. With plants grown under glass in the presence of an excess of a single salt, chlorine, bromine, or fluorine increased the osmotic concentration of expressed sap, as measured by depression of the freezing point. Increased osmotic concentration in tobacco is therefore correlated with enlargement of the leaf cells. The osmotic-concentration values tended to increase with the age of the plant. The leaves of tobacco plants receiving excessive quantities of chlorides or bromides had less bound water than leaves of plants grown in a medium deficient in mineral nutrients. The crop responded to the sodium fluoride by transforming free water to bound water in such quantities as to indicate that this compound induces a state of physiological drought.

Sap of tobacco plants field-grown in the presence of excessive quantities of chlorides had a lower osmotic concentration and less bound water than that of field-grown plants receiving a liberal application of a complete fertilizer,

The lower values of the sap of chlorine-injured leaves may be partly explained by physiological immaturity and low organic-acid content.

Wheat (*U.S. Dept. Agr. Yearbook 1933*, pp. 139-170, figs. 8).—The status of the wheat crop in the United States during recent years is summarized in brief articles entitled *Wheat's Economic Position Affected by Surpluses and World Trade Restrictions*, by G. A. Collier, J. L. Orr, and E. J. Working (pp. 139-147); *Nearly 300 Varieties of Wheat Grown on United States Farms*, by S. C. Salmon (pp. 147-153); *Wheat's Rotation Use is Largely Determined by Crop Competition*, by J. S. Cole and S. C. Salmon (pp. 153-158); *Wheat Does Best in Well-Drained, Fertile Loams, Responds to Fertilizer*, by B. E. Brown (pp. 158-161); *Wheat is Attacked by Rusts, Smuts, and Other Destructive Diseases*, by H. B. Humphrey (pp. 161-168); and *Wheat is Attacked by Insects at Each Stage in Life of the Plant*, by W. H. Larrimer (pp. 169, 170).

Comparative responses of a spring and a winter wheat to day length and temperature, A. M. HURD-KARRER (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 10, pp. 867-888, figs. 9).—The Hard Federation spring wheat variety and Turkey, a winter type, were grown in the greenhouse at Arlington, Va., with short (8 hours), natural (9.5 to 15 hours), and long (17 hours) light periods at $12^{\circ}\pm 1^{\circ}$ C., favorable for wheat growth, and at $21^{\circ}\pm 1^{\circ}$, too high for the best development of even the spring variety. Temperature control was maintained from December until early April.

The long day hastened the development of both varieties, especially Hard Federation, while the short day retarded both sorts. At the low temperature the short day increased leaf size, head length, and, generally, number of tillers, and decreased kernel weight and plant yield of both varieties, causing complete sterility in Turkey in two of three tests. The long day decreased dry weight, tillering, head length, and total grain yield in both wheats, although the yield per head and average kernel weight of Turkey were always highest at this day length. The short day depressed grain yield in Turkey more than the long day, and vice versa in Hard Federation. The high temperature damaged the winter variety more than the spring variety, the heading of Turkey being sparse and plant growth abnormal above 20° .

The bibliography comprises 40 titles largely concerned with the length of day and temperatures.

A study in sampling technique with wheat, R. J. KALAMKAR (*Jour. Agr. Sci. [England]*, 22 (1932), No. 4, pp. 783-796, fig. 1).—When a plat of 80 rows of Yeoman II wheat 8.17 m (26.8 ft.) long and 6 in. apart was harvested in 0.5-m units at Rothamsted, border rows significantly outyielded inside rows, and variation between rows greatly exceeded that within rows. A sampling unit comprising 4 parallel 0.5-m lengths on adjacent rows seemed most precise, and 18 of such units, amounting to 36 m of drill from $\frac{1}{40}$ -acre plats would give about 5 percent sampling error. The significant correlation of 0.73 between yield and spike number indicated that increased precision can be obtained for the prediction of yield when the number of spikes is known.

The weed seed population of arable soil.—II, Influence of crop, soil, and methods of cultivation upon the relative abundance of viable seeds, W. E. BRENCHLEY and K. WARINGTON (*Jour. Ecol.*, 21 (1933), No. 1, pp. 103-127, figs. 4).—The numbers of buried weed seeds in Stackyard field at Woburn, which was in continuous wheat and barley from 1877 to 1926, were determined before and after several years of cultivated fallow, and the results obtained were compared with data from similar studies at Rothamsted (*E.S.R.*, 64, p. 32). The responses of the several species to cropping and fallow are detailed.

With similar soil conditions the composition of the weed flora under continuous wheat and barley was about the same, but the relative abundance of the species varied greatly, some being favored by wheat and others by barley. Spring cultivation before barley sowing tended to keep the number of buried weed seeds below those in fall plowed wheat soil. Most species were variably reduced in number by fallow, while a few kinds might even be increased. Such variations seemed to depend upon the correlation between the times of fallowing operations and the periods of maximum germination of the different species, coupled with the length of natural dormancy. If the interval between cultivations are too prolonged some species can mature and replenish the soil with so many seeds that the benefits of fallow are entirely lost. Weed species were observed to vary considerably in their ability to recolonize the soil in this way.

When land is cropped the cultivation processes affect the weed flora more variably than fallowing. On the same area some species may be reduced drastically, while others may be doubled or trebled in quantity. Some weed species are reduced by both cropping and fallowing. Other species may be generally reduced by fallowing, but behave variably under crop.

The use of kainite for the control of poison ivy, O. BUTLER (*Jour. Amer. Soc. Agron.*, 24 (1932), No. 12, pp. 979-981; also *New Hampshire Sta. Sci. Contrib.* 39 (1932), pp. 4).—When kainite was ground to various degrees of fineness, with and without addition of peat, all samples were effective in killing poison ivy, but finely ground material distributed better and adhered to the foliage better than the coarser salt. Kainite is broadcast on the plant at about 0.1 lb. per square foot for the first application, preferably covering the leaves thoroughly when wet by dew or rain. Since poison ivy ordinarily sprouts again after treatment, two or more applications may be needed.

How to control ragweed, the principal cause of autumn hay fever, B. W. GAHN (*U.S. Dept. Agr. Leaflet* 95 (1933), pp. 2).—The relation of ragweed to autumn hay fever is pointed out, and common ragweed (*Ambrosia elatior*) and big ragweed (*A. trifida*) are described briefly. Ragweed may be controlled by cutting each year, first just before the flowers form and again before flowers develop on the low-growing branches that shoot out after the first cutting. In corn and other field crops, ragweed is controlled by early cultivation to kill the young weeds and by later cultivation after the crops are harvested. Close rotation of crops is advised, especially a rotation that involves plowing the field just after harvest. Infested stubble lands should be plowed shallow before the ragweed forms flowers, and infested pastures should be mowed just before this stage.

Spontaneous combustion on weed plats sprayed with a solution of Atlacide, D. C. TINGEY (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 4, pp. 297-299, figs. 2).—In the case of a fire starting spontaneously on the same day that a commercial form of calcium chlorate was sprayed on Canada thistle plats in bluegrass pasture at the Utah Experiment Station, heavy undergrowth of bluegrass and sudden rise in temperature and drop in humidity seemed to be the important contributing factors.

HORTICULTURE

Fruits and vegetables (*U.S. Dept. Agr. Yearbook* 1933, pp. 319-368, figs. 4).—Under the above heading are presented the following articles of a general nature: Decade of Expansion. Leaves Most Products Depressed, but a Few Are in Active Demand, by W. A. Sherman, G. Burmeister, and A. C. Edwards (pp. 319-325); Citrus Growers Try Out New Varieties as Supply of Standard Sorts

Mounts, by T. R. Robinson and A. D. Shamel (pp. 325-328); Fruit and Nut Industries Show Decided Trend Toward Higher-Quality Production, by J. R. Magness et al. (pp. 328-335); Vegetable Breeding and Disease Studies Win Important Results (pp. 335-344); Quality Progress Marks Present Stage of Canning, Drying, and Preserving, by J. S. Caldwell (pp. 344-348); Methods of Handling, Transporting, and Storing Perishables Improved, by D. F. Fisher (pp. 348-354); Control of Fruit and Nut Diseases by New Method Making Headway, by M. B. Waite (pp. 354-359); Utilization of Fruits and Vegetables Aided by Chemical Discoveries, by H. G. Knight (pp. 359-364); and Research Develops New Ways to Fight Pests of Fruits and Vegetables, by B. A. Porter and W. H. White (pp. 364-368).

[**Horticulture at the Hawaii Station**], J. C. RIPPERTON, D. W. EDWARDS, and W. T. POPE (*Hawaii Sta. Rpt. 1932*, pp. 6, 7, 8-11, 13-18, figs. 8).—Brief reports are given on studies of factors influencing the quality of Macadamia nuts; of methods of rejuvenating old coffee plantations; of fertilizer trials with coffee; and of miscellaneous cultural and varietal tests with coffee, the Macadamia nut, the avocado, citrus, the litchi and longan, the akala, the pejobaye palm, the passion fruit, and the papaya.

[**Horticulture at the Maryland Station**] (*Maryland Sta. Rpt. 1932*, pp. XIX-XXII).—In a brief manner there are discussed the results of fertilizer and pollination experiments with the apple, fertilizer studies with the strawberry, pruning studies with the peach, and miscellaneous varietal and cultural studies with vegetables.

[**Horticulture at the Massachusetts Station**], M. E. SNELL, A. B. BEAUMONT, L. H. JONES, H. D. HASKINS, H. J. FRANKLIN, W. H. SAWYER, H. E. WHITE, R. E. YOUNG, G. B. SNYDER, F. W. MORSE, F. C. SEARS, J. K. SHAW, A. P. FRENCH, J. S. BAILEY, O. C. ROBERTS, R. A. VAN METER, W. H. THIES, C. I. GUNNESS, W. R. COLE, A. I. BOURNE, P. W. DEMPSEY, ET AL. (*Massachusetts Sta. Bul. 293* (1933), pp. 9, 10, 19, 20, 23-25, 39, 40, 43-45, 47, 48-54, 59, 60).—In a brief manner there are presented the results of experiments in fertilizing and breeding onions; forcing gladiolus with artificial light; the physiology of plant growth in containers; the nutrient factors related to the region of root distribution in plant containers; the chemical composition of cranberries; stock and scion relations in apples; distinguishing characters of nursery cherry and other trees; genetic composition of peaches; apple pruning; cultural and fertilizer requirements of apple trees; variety tests of apples, raspberries, strawberries, and other fruits; fruit bud formation in the strawberry; spray materials; and apple pollination.

Studies at the Cranberry Substation dealing with cranberry varieties, bog irrigation, and pollination are briefly reviewed, as are also studies at Waltham relating to the effects of plant nutrients on carnations and roses; the breeding of snapdragons for resistance to rust; the fertilization and culture of asparagus; the improvement of squash, beans, beets, carrots, lettuce, peppers, and sweet corn by selection; the sugar content of sweet corn varieties; the taxonomy of eggplants; the use of electricity for heating hotbeds and propagating benches; and vegetable variety tests.

The influence of the length of day on lettuces, M. A. H. TINCKER (*Gard. Chron.*, 3. ser., 93 (1933), No. 2424, pp. 404-406, figs. 4).—In experiments conducted at the Royal Horticultural Gardens, Wisley, England, potted lettuce plants grown under comparable temperature and moisture conditions but subjected to modifications in the photoperiod showed definite vegetative and reproductive responses to the length of light exposure. Under winter conditions supplemental light without heat caused increased vegetative growth. In

summer trials with five varieties there were noted distinct varietal peculiarities in response to the light period. For example, Early Paris and Stanstead Park varieties responded to an increased photoperiod by a more rapid development of flower stalks and to shorter than regular day lengths by an increased vegetative development. None of the five lettuces grew well with less than 6 hours of light. From a practical standpoint it appeared that varieties of lettuce might be selected for special seasonal adaptations.

Structural and metabolic after-effects of soaking seeds of Phaseolus, W. M. BAILEY (*Bot. Gaz.*, 94 (1933), No. 4, pp. 688-713, figs. 3).—At the Hull Botanical Laboratory, Early Valentine bean seeds immersed in distilled water with aeration were injured in viability by as little as 8 hours of soaking. Practically complete failure to germinate followed immersion for from 7 to 9 days, and certain of the seeds which germinated in shorter treatments were weakened so that the plants failed to mature. Leaf blades of plants from treated seeds were generally thinner and more compact in structure than those of the controls. The addition of calcium nitrate in very small amounts to the water did not prevent the harmful effects.

Soaking resulted in a marked relative increase in reducing sugars, starch, total carbohydrates, and solids, and a relative decrease in total nitrogen, organic nitrogen, amino acid nitrogen, and proteins in the resulting mature plants, apparently caused by decreased ability of the plant to form nitrogen compounds from carbohydrates.

The carbon dioxide output of the sprouting seeds was increased by soaking. A small decrease in catalase activity followed by a considerable increase was observed in seeds soaked in aerated water, while without aeration there was a regular decrease.

Golden Cross Bantam sweet corn, G. M. SMITH (*U.S. Dept. Agr. Circ.* 268 (1933), pp. 12, figs. 6).—A description is presented of a new single cross hybrid yellow sweet corn developed in breeding investigations conducted in cooperation with the Indiana Experiment Station. The new corn is said to possess marked resistance to bacterial wilt, *Aplanobacter stewartii*, and in field trials proved more productive than commercial strains of Golden Bantam, Whipple Yellow, and other varieties ripening at comparable dates. The two selfed lines Purdue Bantam and Purdue 51 from which the new corn is produced by hybridization are described, and general directions presented for producing seed.

Tomato fertilization.—I, The effect of different fertilizer ratios on the yield of tomatoes, M. M. PARKER (*Virginia Truck Sta. Bul.* 80 (1933), pp. 1067-1082, figs. 4).—Experiments conducted in Westmoreland County on a sandy loam soil of very low fertility showed poor results from commercial fertilizers used alone, but when supplemented with stable manure yields were greatly increased. Of various formulas used in trials on several farms in the same county a mixture of 4 percent ammonia, 10 percent phosphoric acid, and 6 percent potash gave the best yields. It is conceded, however, that on very fertile soils a 2:10:6 mixture might be preferable. Where any one of the three principal elements, N, P, or K, was omitted yields were markedly reduced. An increase in ammonia from 0 to 4 percent increased yields 1.3 tons per acre, but above 4 percent overvegetative growth resulted, with a slight decline in production. Increasing phosphoric acid from 0 to 4 and 8 percent increased average yields by 3.64 and 5.38 tons per acre, respectively. Increasing the potash from 0 to 4 and 6 percent increased yields by 2.4 and 2.8 tons per acre, respectively, but larger amounts of potassium failed to increase yields further.

Fertility relationships in fruits [trans. title], P. BRANSCHIEDT (*Gartenbauwissenschaft*, 7 (1933), No. 5, pp. 546-566).—A high degree of parthenocarpy

was observed in the Poiteau pear. The apple cross Landsberg ♂ × Boskoop ♂ was sometimes successful and sometimes a failure, and since pollen was procured from different trees of the Landsberg parent it is assumed that this variety may not be a stable genetic unit, a situation previously observed in the Louise pear. Sweet cherries were found practically self-sterile, although some degree of self-fertility was observed in Napoleon, a situation believed indicative of a lack of genetic purity in certain varieties of sweet cherries. Reciprocal intersterility was observed in the three sweet cherry combinations Haumüller × Freinsheimer Schloss, Haumüller × Freinsheimer Early Black, and Napoleon × Schneider Late. On the other hand the two Freinsheimer sweet cherries were fully interfertile. All of the sour cherries examined proved self-fertile, but in general sour cherries were pollinated better by sweet cherries and vice versa. The tetraploid cherry Queen Hortense functioned satisfactorily either as a pollen or ovule parent.

Root studies.—III, Pear, gooseberry, and black currant root systems under different soil fertility conditions, with some observations on root stock and scion effect in pears, W. S. ROGERS (*Jour. Pomol. and Hort. Sci.*, 11 (1933), No. 1, pp. 1-18, pls. 6, figs. 4).—In this third contribution (E.S.R., 68, p. 762) information is presented on the root growth of 5 pears, 4 gooseberries, and 9 black currants excavated from an 8-year-old plantation on sandy soil in Kent, England. Part of the pears were on seedling roots and part on Angers quince.

The seedling and the quince roots penetrated to maximum depths of 11 ft. and 8 ft. 1 in., respectively, with the bulk of the quince roots shallower than those of the seedling pears. Gooseberry and currant roots attained a maximum depth of 8 ft. 1 in. and 7 ft., respectively, and in both cases extended laterally very little beyond the branch spread.

Where heavy applications of manure had been applied at the time of planting, both root and top growth in all three species were materially increased but with a tendency for the root systems to be more compact in the manured trees. The ratio of top to root was increased by manuring in the pear and decreased in the gooseberry. Root growth was resumed in all three species while the tops were still visibly at rest.

[**Spray schedules for fruits**], F. W. FAUROT (*Missouri Fruit Sta. Circs.* 23 (1932), pp. 2; 24, pp. 4; 26, p. 1).—Prepared in mimeographed form, these circulars present schedules and certain general spraying information relating to peaches, apples, and cherries, respectively.

Chinese apricot and Black Orb cherry identified as old varieties, F. M. COE (*Better Fruit*, 27 (1933), No. 12, p. 6).—Varietal studies at the Utah Experiment Station showed the Chinese and Jones apricots to be identical with the Large Early Montgamet and the Black Orb cherry to be really the Schmidt.

Factors affecting the breaking strength of apple tree crotches, L. H. MACDANIELS (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), p. 44).—An examination at the New York Cornell Experiment Station of 20-year-old Northern Spy, Wealthy, Twenty Ounce, and Baldwin trees showed in more than half the primary crotches bark inclusions sufficient to cause serious weakness. On the other hand, McIntosh and Rhode Island Greening were practically free from such inclusions. Breaking tests with Wealthy, Twenty Ounce, and York Imperial crotches indicated that equal size of the two arms promoted weakness and that the angle was of no great significance if there was no bark inclusion. More than two side branches originating at the same level on the trunk tended toward weakness.

Effect of nitrogen fertilization on the recovery of a York orchard from drought injury, R. D. ANTHONY (*Penn. State Hort. Assoc. News*, 10 (1933),

No. 1, pp. 20-23).—Observations by the Pennsylvania Experiment Station in an orchard in Franklin County in which the average soil depth was estimated to be less than 3 ft. showed that practically all trees which had been previously weakened by mouse or other trunk injuries were killed by the drought of 1930. Unfertilized trees showed relatively less injury than did those receiving nitrogen. The effects of drought were such that the average yields for the trees for the 3 years beginning with 1930 were approximately the same on all plats, except that trees receiving the equivalent of 15 lb. of nitrate of soda were below the rest. However, the high nitrogen trees made the greatest terminal growth in 1932, suggesting a substantial recovery.

Possible changes in the waxlike coating of apples caused by certain spray and other treatments, K. S. MARKLEY and C. E. SANDO (*Plant Physiol.*, 8 (1933), *No. 3, pp. 475-478*).—As a further contribution to the general study (E.S.R., 69, p. 368) the results are presented of determinations by the U.S. Department of Agriculture of the surface constituents of Washington-grown Jonathan apples taken from unsprayed and from trees sprayed with various materials. In all cases the values for ursolic acid, oily fraction, and total ether extract were higher in the sprayed fruit, and with but few exceptions the individual values were higher for oil-sprayed than non-oil-sprayed apples. Cutin was highest in the oil-sprayed fruits. It is believed that the difficulty experienced in removing spray residues cannot be attributed directly to an accumulation of mineral oil from the applied spray, but rather to an increase of all the ether-soluble waxlike constituents as a result of physiological stimulation. The authors believe it possible that the application of mineral oils may exert a semisolvent action on the natural waxes, causing the lead particles to be more easily and firmly encompassed.

Measuring apple color with a disc colorimeter, A. L. SCHRADER and J. H. BEAUMONT (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), *pp. 45-50*).—Briefly describing the construction and operation of the disk colorimeter, the author presents the results of observations at the University of Maryland on Stayman Winesap and Rome Beauty fruits, with the conclusion that the instrument offers distinct possibilities as a means of defining differences in apple color in numerical terms.

Abnormality in sweet cherry blossoms and fruit, G. L. PHILP (*Bot. Gaz.*, 94 (1933), *No. 4, pp. 815-820, figs. 5*).—An unusual number of abnormal sweet cherry flowers and fruits noted during the 1932 season are attributed by the California Experiment Station to the unusual period of high temperature in the preceding summer, occurring about the time of flower bud differentiation. That temperature was a factor, was indicated by the fact that Napoleon and Bing growing in the interior hot valleys produced many more double and malformed fruits than in the cool coastal region.

Growth study of the peach fruit, O. LILLELAND (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), *pp. 8-12, figs. 2*).—Although cyclic growth of fruit seemed characteristic for most peach varieties, diameter measurements at the University Farm at Davis, Calif., showed an absence of such cyclic growth in the Triumph and Sneed varieties. No reciprocal relationship could be established between shoot elongation and depressed fruit development, nor was the size of crop a factor, since the same phenomenon was observed on a tree with only 20 fruits. There appeared to be no correlation between the extent, the total growth, and the rate of growth in the depressed period and the ultimate size of the fruit, but the duration of the final period of growth is conceded an important factor in determining ultimate size. Records showed that at least 50 percent of the total solids of the peach accrue during the last 20 to 40 days, suggesting great metabolic activity during this time.

The endocarp on the other hand made its major increase relatively early, and the maximum increase in total solids occurred during the so-called depressed period of growth of the whole fruit. The percentage of dry matter in the kernel continued to increase until maturity, and differed from the endocarp in that the major increase in percentage of total solids came later in the season. The rapid development of the flesh in the third period suggested that delaying thinning beyond the beginning of this period might be wasteful of the tree's reserves.

The growth rate and chemical composition of the Hiley peach from stone formation to flesh maturity, R. V. LOTT (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 1-7).—Of various measurements of peach fruits employed at the Mississippi Experiment Station, dry weight determinations were the most accurate in showing minor fluctuations in growth. Diameter measurements were easiest but failed to give a high degree of accuracy. Based on the fact that the stone attained its greatest dry weight first, it is assumed that the stone reaches physiological maturity in advance of the flesh and kernel. After the stone and kernel reached full size they increased, respectively, 50 and 800 percent in dry weight, and apparently until they reached full size the stone and the kernel were the dominating tissues in the fruit.

Although the percentage of both water-soluble and total nitrogen in the flesh decreased during the period studied, the total amounts increased due to the increase in size of the fruit. A decrease in the amount of nitrogen in the stone while that in the kernel was increasing suggested translocation from the stone to the kernel. A rapid decrease in hemicellulose in the flesh, while sugars were accumulating most rapidly, suggested the existence of a total sugar-hemicellulose equilibrium in plant tissues. Very little sugar was found in the stones. The complex nature of the carbohydrates in the stone and kernels suggests the possibility that thinning immediately after the June drop would decrease the competition between fruits for the complex carbohydrates of high molecular weight. Obviously this conservation of carbohydrates would be greater in large stone varieties.

Studies on the influence of soil moisture on growth of fruit and stomatal behavior of Elberta peaches, F. P. CULLINAN and J. H. WEINBERGER (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 28-33, fig. 1).—This study was conducted by the U.S. Department of Agriculture in a block of 21-year-old Elberta trees divided into two plats. In one the soil was exposed to the prevailing elements plus supplemental water when needed and the other with soil covered about 4 weeks after blooming with waterproof paper. It was observed by July 18 that the soil of the covered area was below the wilting percentage and remained so throughout the period of fruit development, whereas the other plat remained steadily above the wilting point. During the period of final enlargement the fruits on the exposed and protected plats increased in volume at the respective rates of 2.61 and 1.65 cc per day, with final average volumes of 106 and 77 cc.

After July 16 the difference in length of time the stomata remained open began to vary between plats. That humidity of the air as well as soil moisture functioned in stomatal operations was indicated in records taken before and after a rain.

On dry and exposed plats where the leaf ratio on ringed branches was adjusted to 40 per fruit, the final size of fruit was 90.8 and 119 cc, respectively.

Further studies on the relation between leaf area and size of fruit, chemical composition, and fruit bud formation in Elberta peaches, J. H. WEINBERGER and F. P. CULLINAN (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 23-27).—Measurements by the U.S. Department of Agriculture of the growth of peach

fruits located on ringed limbs in which the number of leaves per fruit was regulated again showed (E.S.R., 67, p. 528) increased size and improved flavor correlated with increased leaf area per fruit. The response to leaf area limitation was rapid. Within 10 days the fruits with 80, 60, and 10 leaves were over 36, 30, and 3 percent larger, respectively. Comparisons of fruit on ringed and unringed portions of the same branch showed that with an equal leaf area the ringing process increased the size by approximately 20 percent. Beyond 30 leaves per fruit there was no apparent betterment in flavor, but chemical analysis showed an increase in total sugars up to 80 leaves. The sugar-acid ratios for 10, 20, and 30 leaves were, respectively, 0.144, 0.225, and 0.246. With respect to fruit bud formation branches with 10, 20, and 60 leaves per fruit produced 7, 41, and 56 fruit buds per hundred nodes, respectively. In concluding the author suggests that peach trees must be very heavily loaded with fruit to completely inhibit fruit bud formation, and that even a very light thinning of such trees should aid differentiation processes materially.

Further observations on influence of leaf area on fruit growth and quality in the peach, I. D. JONES (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 34-38, fig. 1).—Continuing earlier work (E.S.R., 67, p. 528), fruits on ringed branches of 6-year-old peach trees were thinned by the North Carolina Experiment Station so that each fruit had 10, 20, 30, 45, and 60 leaves. As the leaf to fruit ratio increased up to 45 leaves, there was an increase in the rate of growth of the fruit. With 60 leaves, however, the rate was actually slower than with 45. Chemical analyses of the fruits showed an increase in percentage of total solids, total sugars, acidity, alcohol-soluble fraction, and possibly the alcohol-insoluble fraction up to and including the 45-leaf group. As the leaf area increased, maturity was hastened and color and flavor improved. The fruit of the unringed branches was intermediate in chemical composition and growth between that of the 10- and 20-leaf groups.

The third report on the Illinois thinning investigations, M. J. DORSEY and R. L. McMUNN (*Amer. Soc. Hort. Sci. Proc.*, 25 (1928), pp. 269-276).—Continuing these investigations (E.S.R., 60, p. 44), in 1928 peach trees of several varieties located at various points in the Illinois peach area were thinned at different times in the period beginning with the end of the June drop and closing with the beginning of the final enlargement culminating in maturity. The results measured in terms of yield and size of fruits indicated that fruit thinning was effective throughout the entire mid-period of fruit growth. By delaying thinning until after the June drop the amount of work was materially reduced. Without exception thinning reduced the total yield per tree, but in most cases increased the proportion of fruits in the higher grades. It is pointed out that the results of thinning are influenced by the condition of the tree and in the case of nonvigorous or nonpruned trees may be negligible. On the other hand the pruning of vigorous trees may act to increase the size of fruits and make necessary simply the thinning of clusters.

Seed size in relation to fruit size in the peach: The fourth report on the Illinois thinning investigations, M. J. DORSEY and R. L. McMUNN (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 13-22).—This, the fourth report in the above series of contributions from the Illinois Experiment Station, discusses certain seed-flesh relationships in the peach and the effects of cultural and thinning treatments on these relationships. Although the stone increases slightly in weight as it matures, it comprises less and less of the fruit as maturity approaches. Larger fruits of a given variety tended to have the larger seeds; for example, in Elberta certain of the largest peaches were as high as 95 percent flesh when hard ripe, while in smaller fruits the percentage of flesh

was as low as 87 percent. Within a variety nonvigorous high carbohydrate trees produced small seeds and high nitrogen trees large seeds. Early thinning did not increase the size of stones within a given size class, and in fact the general growth conditions of the tree influenced stone size more than did early thinning. The largest peaches were formed when growth conditions were favorable throughout the entire period.

The gumming of Phillips Cling peaches, L. D. DAVIS (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), p. 27).—In this brief paper there are described three distinct types of gumming observed on the fruits of the Phillips Cling peach.

Arsenical injury of the peach and some results of studies on its control, R. F. POOLE (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 42-44).—Observations by the North Carolina Experiment Station of peach trees growing in the sand-hills area showed marked injury to foliage, buds, and twigs from applications of acid lead arsenate spray. Early sprays were less injurious to Elberta and J. H. Hale than to Early Rose, Early Wheeler, and other early varieties, but fruit injury was more severe in the late peaches. Although the terminals of vigorous trees were often more severely injured than were those of adjacent diseased trees, the fruit of the latter was always damaged more severely. Heavy, persistent humidity apparently favored the development of the injury.

Emulsified phenol, emulsified cresol, potassium permanganate, and colloidal copper sprays impregnated with acid lead arsenate increased injury, but the addition of chemical and finishing grades of hydrated lime was beneficial. Increasing lime to 10, 20, and even 50 lb. per 50 gal. of water containing 1 lb. of powdered lead arsenate decreased injury. Trees sprayed with concentrated lime held their foliage longer than did any other group. Zinc sulfate seemed to retard the onset but did not reduce the ultimate injurious effects.

Effects of starvation on distribution of mineral nutrients in French prune trees grown in culture solutions, H. L. COLBY (*Plant Physiol.*, 8 (1933), No. 3, pp. 357-393, figs. 15).—Analyses made at the University of California of leaves taken from young French prune trees starved for various mineral nutrients indicated that elemental starvation not only seriously affected the trees but caused considerable redistribution of mineral elements within the tree.

Magnesium starvation resulted in a low percentage of magnesium and a high percentage of nitrogen and phosphorus in the leaves, and the calcium content of such trees was actually lower than that found in those of the minus-calcium trees. An absence of calcium resulted in low nitrogen and ash in all parts except the wood, where the calcium present at the beginning of the experiment seemed to remain untranslocated; in fact trees growing in distilled water finally made far better root and top growth than did those trees receiving all of the elements except calcium. In the potassium-starved plants leaf tissues were high in nitrogen, phosphorus, calcium, and magnesium, and low in ash, with the trunk parts and roots low in nitrogen. The nitrogen-starved trees were very low in nitrogen throughout all parts, with the young wood high and the young roots low in calcium and magnesium. The leaves of the minus-phosphorus trees were high in ash and nitrogen, extremely high in magnesium and iron, and low in calcium, and phosphoric acid was only 28 percent of the normal. All portions except the leaves were low in nitrogen. In the case of the minus-sulfur trees leaf tissues were low in nitrogen and ash and had only 15 percent of the normal sulfur trioxide content. A lack of sulfur decreased potassium absorption and increased the absorption of calcium and magnesium.

H-ion readings upon the expressed sap of the leaves of the different lots of trees showed that elemental starvation was more effective in altering the pH of the leaf sap than were changes in the pH of the culture solution.

The effect of irrigation on the quality of prunes, A. H. HENDRICKSON and F. J. VEIHMEYER (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 39-41, fig. 1).—In a mature Agen prune orchard at the California Experiment Station at Davis, three types of irrigation were compared with one another and with no irrigation. The treatments on the irrigated plats were as follows: (1) Not allowed to reach the wilting percentage at any time, (2) irrigated up to July, and (3) irrigated after permanent wilting had been reached in early July. The leaves of the continuously irrigated trees remained green and turgid throughout the season, while those of the control trees wilted and began to drop before harvest. However, determinations of specific gravity, sugar content, and drying ratios of the prunes from the two plats showed no consistent differences that could be attributed to irrigation. No consistent differences in color or general appearance were evident in the fruit from any of the four treatments. However, in the light crop year of 1931 all fruit was higher in percentage of sugar than in 1930 or 1932.

Photoperiodism as a cause of the rest period in strawberries, G. M. DARROW and G. F. WALDO (*Science*, 77 (1933), No. 1997, pp. 353, 354).—Noting that strawberry plants placed in the greenhouse on September 1 and supplied with supplemental light each evening until 10 o'clock grew well but produced an average of only 0.7 flower cluster per plant up to February, while control plants without the additional light averaged 3.8 clusters, the authors conclude that the photoperiod is an important factor in causing the rest period in strawberries. Rest periods apparently resulted from nutritional conditions following exposures to short daily light periods. That varieties differ sharply in their response to light was seen in the fact that those which thrive in the Southern States become strongly vegetative farther north, and that northern varieties languish when taken south. Unconsciously varieties have been selected for their peculiar adaptability to the photoperiod in any given region.

Strawberries for West Virginia farms, W. H. CHILDS (*West Virginia Sta. Circ.* 64 (1933), pp. 16, figs. 6).—In connection with statistical information regarding the acreage and yield of strawberries in West Virginia there is presented information on the planning and planting of strawberry beds, varieties, culture, harvesting, bed renewal, control of pests, etc.

Flower bud formation in the Concord grape, J. C. SNYDER (*Bot. Gaz.*, 94 (1933), No. 4, pp. 771-779, figs. 22).—Cytological studies at the Iowa Experiment Station on the development of Concord grape buds showed that cluster primordia are initiated in the newly forming buds in the growing region of the shoot simultaneously with the development of the early buds. By the end of the growing season all the buds on the shoot were found to contain approximately the same number of primordial clusters. During the dormant period there was noted a very slight enlargement of the existing subclusters, with the first visible evidence of flower bud formation occurring at about the time the buds began to swell, April 24.

Grape growing in Minnesota, W. G. BRIERLEY and W. H. ALDERMAN (*Minnesota Sta. Bul.* 297 (1933), pp. 20, figs. 3).—This is a general account dealing with the history and present status of grape growing in Minnesota and with the various cultural operations such as pruning, training, supplying nutrients, prevention of winter injury, selection of varieties, spraying, harvesting, etc. Information on grape diseases and grape insects is also included.

Where 4, 6, and 8 lateral canes were left on Beta vines the yields were progressively increased with the increased total length of canes, but with

an indication that 20 to 25 ft. of canes with 70 to 90 buds in total is about the maximum for vines of average vigor. The largest clusters were, however, produced on the heaviest pruned vines.

The effect of soil temperature on the germination of citrus seeds, A. F. CAMP, H. MOWRY, and K. W. LOUCKS (*Amer. Jour. Bot.*, 20 (1933), No. 5, pp. 348-357).—Controlled experiments conducted by the Florida Experiment Station with four species of citrus, namely, grapefruit, sweet orange, sour orange, and rough lemon showed much the same temperature requirements for germination for all four. In general it appeared that the minimum temperatures for the several species were probably below 15° C. (59° F.), the maxima a little below 40°, and the optima between 31° and 35°. Grapefruit and sweet orange seemed to have slightly lower optima than the others, but this relationship was not definitely established. Variations within species for even single lots of seed were such as to render difficult the formulation of definite generalizations.

Eureka lemon pruning test, A. D. SHAMEL and C. S. POMEROY (*Calif. Citrogr.*, 18 (1933), No. 8, pp. 218, 236, figs. 2).—Records taken on Eureka lemon trees 30 years old in 1933 and pruned rather severely in May 1929 showed severe reductions in yield, averaging 26.3 percent for the period February 7, 1930, to May 14, 1932. There were no striking differences in size or grade of fruits as a result of pruning, and whether the new growth will be more productive in the future is considered problematic. According to the authors, severe pruning of older lemon trees should be undertaken only after careful consideration.

FORESTRY

Forestry: An economic challenge, A. N. PACK (*New York: Macmillan Co.*, 1933, pp. [4]+161).—This is a general outlook on the forestry situation in the United States, with a plea for a national forestry policy, for strong and capable leadership, and for Nation-wide recognition of the importance of forestry in the national economic life.

The forests of Maine: Their extent, character, ownership, and products, A. H. WILKINS (*Maine Forest Serv. Bul.* 8 (1932), pp. 110, figs. 49).—A general account of the past and present status of forests and forestry in Maine, with special reference to the principal wood-using industries.

Growth rate of northern white pine in the southern Appalachians, L. I. BARRETT (*Jour. Forestry*, 31 (1933), No. 5, pp. 570-572, fig. 1).—Measurements taken by the Appalachian Forest Experiment Station on the growth of northern white pines in northern Georgia and southwestern North Carolina showed a significantly more rapid growth of the pines than of their nearest competitor, the yellow poplar. For diameter at breast height the odds, according to Fisher's tables for 40, 50, and 60 years, were 2,800, 236,000, and 570, respectively.

Treatment of understory hemlock in the western white pine type, I. T. HAIG (*Jour. Forestry*, 31 (1933), No. 5, pp. 578-583, fig. 1).—Western hemlock (*Tsuga heterophylla*), an aggressive, tolerant, low-value species, was found capable of recovering from suppression and producing larger gross volumes 30 to 40 years after release than did seedling stands grown for the same period. If hemlock is slashed when the pine overwood is logged, it is evident that the area will reproduce satisfactorily and that the reproduction will be chiefly white pine. The decision as to the treatment of such cuttings rests primarily on the condition of the hemlock at the time.

Drought injury in hemlock-hardwood stands in Connecticut, P. W. STICKEL (*Jour. Forestry*, 31 (1933), No. 5, pp. 573-577).—Observations by the Northeastern Forest Experiment Station showed considerable damage to the

forests of southern New England from the long continued subnormal precipitation beginning in 1928. In the vicinity of New Haven, Conn., hemlock appeared to have suffered most severely, and on trap-rock ridges many trees of this species were actually killed. In dense stands as much as 75 percent by basal area was lost, with the reproduction and ground flora also severely injured. The author suggests that hemlock-hardwood stands on poorer sites should be kept fairly open by frequent thinning, because where such silviculture was actually practiced the losses from drought were much less.

Water storage of forest planting stock, H. D. PETHERAM (*Jour. Forestry*, 31 (1933), No. 5, pp. 567-569, fig. 1).—*Ponderosa* pine transplants set out after 1, 2, and 3 days' immersion of their roots in running water showed practically no differences in survival at the end of the first growing season. In another test in which trees were held in running water for 7, 14, and 21 days no damage was evident to the first two lots, but a drop of about 10 percent in survival was noted in the 21-day trees. The possibility is suggested that running water provides sufficient air for root respiration, and it is also thought that temperature may be involved.

Pruning forest trees, B. H. PAUL (*Jour. Forestry*, 31 (1933), No. 5, pp. 563-566).—This is a digest of methods employed and results obtained in various forest tree pruning experiments in the United States.

Experiments with calcium chloride as a forest fire retardant, P. W. STICKEL (*Jour. Forestry*, 31 (1933), No. 5, pp. 533-542, figs. 2).—In field experiments conducted in Massachusetts by the Northeastern Forest Experiment Station applications of calcium chloride, either dry or in solution, showed some value as fire retarders but were limited in effectiveness by heavy rains which washed the chemical downward to the soil. Determinations of the moisture content of white pine-hemlock litter collected at 2 p.m. from the several plats showed more moisture in calcium chloride areas. Dusting calcium chloride on grass plats was ineffective in stopping running fires except in one case where a light rain had dissolved the chemical. Watering grass plats with calcium chloride solution killed the grass but left it in a moist condition. The author believes that calcium chloride may be useful along railroad lines where regrowth of vegetation is not desired, but because of the slowness with which the chemical absorbs water from the atmosphere when the relative humidity is low it has practically no value as a suppressor of existing fires.

Top diameter utilization limits for Delta hardwoods, G. H. LENTZ (*Jour. Forestry*, 31 (1933), No. 5, pp. 547-550, fig. 1).—A study made by the Southern Forest Experiment Station of tree measurements taken in bottom land hardwoods of the Mississippi Delta showed that as the diameter at breast height increased the diameter at the top of the last merchantable log also increased. This suggested that the use of a fixed top diameter limit in cruising the volume of hardwoods gives erroneous indications of the merchantable volume.

A new hypothesis as to the cause of shakes and rift cracks in green timber, A. KOEHLER (*Jour. Forestry*, 31 (1933), No. 5, pp. 551-556, figs. 3).—The belief is expressed that the death of the parenchyma cells in the inner sapwood and the partial dehydration of the tissues in general in the heartwood of many species may set up permanent internal tensions which cause shakes and rift cracks. Hereditary differences in the ratio of circumferential to radial growth may account for the general tendency for shake to be more prevalent in certain species.

Compression wood in hoop and bunya pine, H. E. DADSWELL and I. LANGLANDS (*Jour. Council Sci. and Indus. Res. [Aust.]*, 6 (1933), No. 2, pp. 120-124, pls. 2).—On the basis of a limited number of tests the authors conclude

that compression wood found in the Australian pines *Araucaria cunninghami* and *A. bidwilli* is similar in appearance, properties, and structural characteristics to that occurring in North American softwoods. Compression wood was found to be 1.33 times as dense as the normal wood in the same log.

The mechanical properties of Canadian woods, G. H. ROCHESTER (*Canada Dept. Int., Forest Serv. Bul. 82 (1933), pp. 88, figs. 83*).—Data are presented on the physical characteristics and mechanical properties of Canadian woods, compiled from the results of approximately 100,000 mechanical tests and physical determinations on small clear specimens. The tests included 29 broad-leaved species and 20 conifers.

The 49 species tested showed wide variations in strength. In addition to the variations between the species, there were within the same species considerable differences in the strength of specimens from different trees and also from different parts of the same tree. The values given in the tables for each strength function of each species are therefore the average of a great number of such individual tests.

An analysis of the data shows that there is a comparatively wide range of values for specific gravities of wood samples from the different species and also for different samples from the same species. In some instances the presence of infiltrated substances, such as resins and oils, has a marked influence upon specific-gravity values, but in most cases the differences in these values are to be accounted for principally by the varying amounts of actual wood substance per unit volume in the samples taken—the greater the quantity the higher the specific gravity.

The relation between the maximum crushing strength in compression parallel to grain and the specific gravity for the different species indicates increase in strength with increase in specific gravity. The curves for both the green and the air-dry values show that strength of the wood in compression parallel to the grain varies directly with its specific gravity.

For the conifers there is an optimum rate of growth for the production of timber having the highest strength values. This rate is not the same for all species. Jack pine, for instance, has a more rapid optimum rate of growth than has either white or red pine. In all cases, however, the decrease in strength due to very slow growth is less than the reduction due to very rapid growth. For balsam poplar, paper birch, aspen poplar, shagbark hickory, and chestnut, an optimum growth rate for strength is indicated. For yellow birch, red maple, and beech the rate of growth has no marked influence upon the strength, while for white and red oak the strength decreases with decrease in rate of growth.

The curve relation indicates for the conifers an optimum growth rate for the highest specific gravity. Some of the lighter hardwoods, such as chestnut, balsam poplar, and aspen poplar, might be included in the group with the conifers, as they have the same general form of curve. For the hardwoods which have a fairly even distribution of the pores throughout the season's growth the rate of growth apparently has little effect upon the specific gravity. For the heavier ring porous woods, such as red oak, white oak, and shagbark hickory, a decrease in rate of growth is accompanied by a decrease in specific gravity. The general trend of the curves indicates that with an increase in the proportion of summer wood there is an increase in strength and in specific gravity. The strength of Douglas fir remains constant for all moisture contents above the theoretical fiber saturation point, but below this point any reduction in moisture is accompanied by an increase in strength.

The data further indicate no appreciable difference in the strength values for sapwood and heartwood.

DISEASES OF PLANTS

Manual of plant diseases, F. D. HEALD (*New York and London: McGraw-Hill Book Co., 1933, 2. ed., pp. XII+953, figs. 259*).—This is the second edition of the work previously noted (E.S.R., 57, p. 343).

Atlas of diseases of agricultural plants, O. APPEL (*Atlas der Krankheiten der Landwirtschaftlichen Kulturpflanzen. Berlin: Paul Parey, 1928, 2. ser., pp. 27, pls. 12; 1933, 3. ser., pp. 27, pls. 11*).—The text describes the diseases and injuries caused, the parasites (fungi, bacteria, insects), where any are involved, and control measures. In continuation of series 1 (E.S.R., 54, p. 447), series 2 includes cereals, maize, potato, sugar beet, pea, and orchard fruits; and series 3 includes cereals, potato, sugar beet, grasses, tomato, hops, and dodder on flax and clover. The illustrations are by A. Dressel.

Pocket atlas of vegetable diseases, O. APPEL (*Taschenatlas der Gemüsekrankheiten. Berlin: Paul Parey, 1933, pp. [51], pls. 24*).—This consists mainly of 24 colored plates, by A. Dressel, each with an accompanying page of text, illustrating and describing, with control measures, the common diseases and insect pests of vegetable crop plants.

Diseases of plants in the United States in 1931 and 1932, compiled by P. R. MILLER, N. E. STEVENS, and J. I. WOOD (*U.S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1933, Sups. 84, pp. 65, figs. 23; 85, pp. 82, figs. 27*).—The prevalence of and losses caused by diseases of cereal, forage, and special crops, vegetables, trees, ornamentals, fruit, and nut crops in 1931 and 1932 are indicated for different parts of the United States, and the relation of weather to plant diseases is discussed briefly.

[**Plant disease studies in Maryland**] (*Maryland Sta. Rpt. 1932, p. XVI*).—Brief notes are given on wilt resistance in peas, tomato mosaic, and bean anthracnose.

[**Plant disease studies at the Massachusetts Station**] (*Massachusetts Sta. Bul. 293 (1933), pp. 15-19, 20, 21, 45, 60, 61, 62, 63*).—Progress results are briefly noted on the black and brown root rots of tobacco, disease resistance of potato varieties, and downy mildew of cucumbers and lettuce, by W. L. Doran; eggplant wilt and control of greenhouse vegetable diseases, by E. F. Guba; eradication of nematodes in greenhouse soils by chemicals, by L. H. Jones; acetic and pyroligneous acids as soil disinfectants, by Doran; carnation blight (*Alternaria dianthi*) and strawberry gold leaf, by Guba; diseases of unusual importance in 1932, by O. C. Boyd and W. H. Davis; dark center or internal breakdown of turnips, by G. B. Snyder and R. W. Donaldson; and by the U.S.D.A. Bureau of Plant Industry in cooperation with the station, the development of strains of cranberry resistant to false blossom, by H. F. Bergman, W. E. Truran, and J. L. Kelley; the oxygen content of flooding water in relation to injury to cranberry vines, by Bergman and Truran; regeneration of false blossom bogs, by Bergman and Kelley; the effect of copper residues from Bordeaux spray on the growth of cranberry vines, by Bergman and Truran; spraying experiments with Bordeaux and organic mercurial sprays and the storage of cranberries, both by Bergman, Truran, and Kelley; and black root rot of tobacco, by C. V. Kightlinger.

Reports on research for 1932: Plant pathology, G. M. REED (*Brooklyn Bot. Gard. Rec., 22 (1933), No. 2, pp. 53-57*).—A review is given of current results of studies on the inheritance of resistance of oat hybrids to loose and covered smuts. The 286 fourth generation hybrids derived from the crosses Silvermine × Black Mesdag and Early Champion × Black Mesdag proved, with only five exceptions, resistant to both smuts. Further studies on physiologic races of oat smuts indicated the existence of additional races. In one

case a race of covered smut exhibited a temperature optimum for infection 10° C. higher than the optimum for most races. Notes are also given on studies on inheritance of resistance in sorghum to loose and covered smuts.—(Courtesy Biol. Abs.)

Directory of field activities of the Bureau of Plant Quarantine, 1933 (U.S. Dept. Agr., Misc. Pub. 155 (1933), pp. [2]+48, fig. 1).—This pamphlet contains information concerning the location of field stations, names of the personnel in charge, and brief statements of the work under way.

Antagonism in nature of *Penicillium digitatum* and *P. italicum* [trans. title], F. GIOELLI (*Riv. Patol. Veg.*, 22 (1932), No. 7-8, pp. 195-200, figs. 3).—In studying the rots of citrus fruits it was noted, especially on lemons invaded by *P. digitatum*, that there were small areas attacked by *P. italicum* surrounded by a clear zone. It was found possible to produce such cases artificially.—(Courtesy Biol. Abs.)

A new *Sclerotium* disease of *Echinochloa crusgalli* Beauv. subsp. *submutica* Honda var. *typica* Honda caused by *Sclerotium fumigatum* Nakata, S. ENDÔ and S. SAKITA (*Tottori Nôgaku-Kwaihô* (Trans. Tottori Soc. Agr. Sci.), 4 (1932), No. 2, pp. 106-110, fig. 1).—This sclerotial disease, previously unknown on this host, was first found at Mototanaka near Kyoto in 1928. The causal fungus was found to be identical with *S. fumigatum*, which causes sclerotial disease of rice and other plants. Its cultural characters and morphology are given.

Inoculation experiments showed that *E. crusgalli* Beauv. subsp. *colona edulis* and *Oryza sativa* are also subject to the disease.

Studies upon the copper fungicides.—II, Some modifications of Bordeaux mixture designed to overcome practical difficulties in its application, H. MARTIN (*Ann. Appl. Biol.*, 20 (1933), No. 2, pp. 342-363).—To permit incorporation of a contact insecticide or direct fungicide in Bordeaux mixture and to overcome difficulties met in the application of Bordeaux mixture as a fine mistlike spray, two modifications are proposed which may be applied in larger quantities after the manner of an insecticidal wash: (1) The incorporation of concentrated sulfite lye in the Bordeaux mixture, and (2) the glyceride oil emulsion produced by the use of Bordeaux mixture as an emulsifier. As examination of the amounts of copper retained on foliage after spraying showed that the presence of oil improves the retention of spray deposit, the content of copper sulfate and lime of the oil Bordeaux emulsion was reduced to half that of Bordeaux mixture used in comparisons of fungicidal efficiency by field trials.

The results of field trials show that, under the conditions prevailing in 1931 and 1932, (1) the modified Bordeaux mixtures applied in heavy amounts proved as effective as lighter applications of Bordeaux mixture for the control of potato blight and apple and pear scab; in one trial, the fungicidal efficiency of an oil Bordeaux emulsion, in which a vegetable oil of high free fatty acid content was used, was below that of Bordeaux mixture containing double the amount of copper sulfate and lime. (2) The application of large quantities of the modified Bordeaux mixtures did not cause greater leaf injury or fruit russetting than Bordeaux mixture used in smaller amounts. (3) Combinations of nicotine with the modified Bordeaux mixtures gave washes of insecticidal efficiency equal to that of nicotine soap wash. (4) As a result of the use of a spray of larger volume, the application of the modified Bordeaux mixtures was easier and more rapid than that of Bordeaux mixture.

A method is described for the estimation of copper retained on sprayed foliage.—(Courtesy Biol. Abs.)

Toxic action of coal-tar creosote, with special reference to the existence of a barren nontoxic oil, H. SCHMITZ and S. BUCKMAN (*Indus. and Engin. Chem.*, 24 (1932), No. 7, pp. 772-777, figs. 6).—In a study carried on at the University of Minnesota, a representative sample of coal tar creosote was fractionally distilled and ultimately separated into 11 parts, and the toxicity of these to several wood-destroying fungi was determined by the ordinary toximetric methods.

The presence of large amounts of nontoxic substances has not yet been demonstrated. So-called barren oil cannot properly be considered as nontoxic to wood-destroying fungi. Although high concentrations of barren oil do not completely inhibit their growth, even relatively small amounts exert marked toxic effects.—(*Courtesy Biol. Abs.*)

Experiments on the control of seed-borne diseases by X rays, W. R. TASCHER (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 10, pp. 909-915).—The reaction of pure cultures of fungi and the reaction of the host and associated parasite to X-rays were studied at the Missouri Experiment Station as phases of the problem of controlling seed-borne diseases.

The fungi in cultures differed widely in tolerance to X-rays, the decreasing order being *Fusarium moniliforme*, *Cephalosporium acremonium*, *Gibberella saubinetii*, and *Diplodia zaeae*. While *D. zaeae* was quite susceptible to X-rays in growing cultures, it was extremely resistant in dormant corn seed, a dose several times the lethal dose for corn being required to affect the organism. Organic mercury treatment was effective in partly controlling *D. zaeae*, but appeared ineffective with *G. saubinetii*. X-ray treatments of dormant wheat, barley, and oat seeds, infected with *Ustilago tritici* and *Tilletia laevis*, *U. nuda*, and *U. avenae*, respectively, did not control the organisms. X-ray treatments of germinating seeds decreased the percentage of loose smut of oats and controlled the loose smut of barley completely, although barley germination was decreased to as low as 5 percent. The differential in the killing points of the hosts and their parasites, on which control of seed-borne diseases by X-rays depends, was not found to be sufficient to permit complete control of the organisms studied.

Fusarium species on British cereals: *Fusarium nivale* (Fr.) Ces. (= *Calonectria graminicola* (Berk. & Br.) Wr.), F. T. BENNETT (*Ann. Appl. Biol.*, 20 (1933), No. 2, pp. 272-290, pls. 4, figs. 3).—*F. nivale*, isolated in England from grain of barley, the underground parts of oats, and of ryegrass, is distinguished as a definite strain, differing from the Continental (Schaffnit's) strain (Schneeschemmel) (*E.S.R.*, 31, p. 343) in size of conidia and in form and rate of growth on certain selective media. The British strain grows slowly at 0°-1° C., and in its vegetative state withstands prolonged exposure to temperatures as low as -20°. The optimum is 20°-21°, and growth is most vigorous at summer temperatures. Neither the existence nor the pathogenicity of the fungus is appreciably modified by the acid or alkaline conditions of soils within ordinary field limits.

F. nivale establishes itself on dead or dying tissues and from these invades living tissues in a state of low vitality or suspended growth, but it fails in attack on vigorously growing roots or shoots, hence most damage to cereals occurs during the winter. Aerial parts are rarely infected in normally dry seasons, but under moist conditions there is some reduction of yield and discoloration of grains. The economic importance of *F. nivale* as a pathogen toward cereals varies from considerable under adverse conditions to negligible under most favorable conditions for plant growth.—(*Courtesy Biol. Abs.*)

The relative susceptibility of cultivated and native hosts in Alberta to stripe rust, G. B. SANFORD and W. C. BROADFOOT (*Sci. Agr.*, 13 (1933), No. 11, pp. 714-721, fig. 1).—*Hordeum jubatum* is considered unquestionably the principal host in the initiation, development, and spread of stripe rust in Alberta, being extremely susceptible, widely distributed, and prevalent. It thus appears to be the most suitable host for epidemiology studies in nature. *Agropyron dasystachyum*, because of its uniform susceptibility and fairly common distribution in zone I, southern Alberta, where stripe rust develops first, and also its occurrence in the same zone in east central Alberta, appears to be next in importance to *H. jubatum*. *A. griffithsii* might be given equal rank for the same reason, but it does not seem to be as common as the former host. *A. richardsoni* is, on the whole, as susceptible as *A. dasystachyum* and may be an important host in the central and eastern parts of zone I, although collections from nature differed widely in susceptibility. *A. smithii* indicated only slight susceptibility under the most favorable conditions for test. *A. tenerum*, as it exists in nature in Alberta, appears to be moderately susceptible and often apparently very resistant or immune. One plant only of *A. repens* was found rusted, but this was very susceptible, as were also all plants of a selection of *Bromus ciliatus*.

The varieties of wheat now commonly grown in Alberta are resistant or immune for practical purposes. These include Marquis, Reward, and Garnet.

Principles of measures for the total extermination of smuts in the grain production of the U.S.S.R. [trans. title], A. I. BORGGARDT (*Inst. Zashch. Rast., Trudy Zashch. Rast. (Lenin Acad. Agr. Sci. U.S.S.R., Inst. Plant Protect., Bul. Plant Protect.)*, *Phytopath.*, 2 (1932), pp. 1-79, figs. 18).—In this compendium a critical discussion of the relative value of various control measures is given. Plans are outlined for large scale control. The smuts are divided into three groups according to control measures. The "AB" compound devised by the author in 1927-28 and consisting of $2\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$ 36 percent, gypsum 56 percent, and chalk 8 percent is stated to be most effective in the dry treatment of seed. Its preparation, properties, and use are described in detail.—(*Courtesy Biol. Abs.*)

Effect of depth of seeding on the occurrence of covered and loose smuts in winter barley, J. W. TAYLOR and M. G. ZEHNER (*Jour. Amer. Soc. Agron.*, 23 (1931), No. 2, pp. 132-141, figs. 3).—In a 4-year experiment at the Arlington, Va., Experiment Farm from 2.7 to 115 times as much covered smut (*Ustilago hordei*) was present in Tennessee Winter barley sown at 3 in. as in the same variety sown at 0.5 in. Loose smut (*U. nuda*) was from 2.1 to 44.5 times greater in amount in the 3-in. seeding as compared with the 0.5 in. Wisconsin Winter gave results similar to Tennessee Winter in a 2-year experiment. Esaw and Beardless, varieties resistant to the local covered smut, showed no significant difference in loose smut infection from variation in seeding depth.—(*Courtesy Biol. Abs.*)

The biology of oat smuts.—III, The development of two biological species of *Ustilago kolleri* (Wille) in a selection of *Avena strigosa orcadensis* (Marquand), K. SAMPSON (*Ann. Appl. Biol.*, 20 (1933), No. 2, pp. 258-271, pl. 1, figs. 5).—This paper deals with microscopic observations on the invasion of a selection of *A. strigosa orcadensis* by two biological species of *U. kolleri*, which differ by nearly 100 percent in their capacity for producing smutted panicles on this host. Under certain prescribed experimental conditions both strains enter the oat plant with equal facility, but one is retarded in development and fails to reach the growing apex before the tissues of the primary node become lignified, with the result that the panicles produced are not infected.

The results are discussed in relation to the problem of the inheritance of resistance to smut in oats.—(*Courtesy Biol. Abs.*)

Factors affecting infection of wheat heads by *Gibberella saubinetii*, G. W. PUGH, H. JOHANN, and J. G. DICKSON (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 9, pp. 771-797, figs. 12).—Inoculation experiments and histological studies of wheat scab or head blight, caused by *G. saubinetii*, together with macroscopic observations directly bearing on the host-fungus relationship, are reported by the Wisconsin Experiment Station and the U.S. Department of Agriculture, working in cooperation.

The inoculations of heads of pure line Prelude and Marquis wheat, incubated in controlled temperature and humidity chambers in the greenhouse or in glassine bags in the field, were most effective when heads were blossoming or had just passed the blossoming stage, although infection resulted from inoculation from in-the-boot to past-flowering stages. Length of incubation period varied with the stage of development of the head at time of inoculation and with the temperature during incubation. When heads were inoculated before blossoming, the position of the first spikelet to show infection, and the progress of infection to other spikelets, were suggestive of the place of beginning and progress of anthesis rather than of advance through the rachis.

Infection often was observed to begin in anthers which failed to clear the glumes. Counts of healthy control heads showed that reduction of anthers did not depend on infection. The high percentage of caught anthers occurred in the spikelet ranges in which initial infections were found to occur. It is thought that infection occurs at flowering time or shortly after, due to the presence of anthers or other degenerating tissue on which the fungus first develops as a saprophyte and from which it proceeds to the developing kernel. Neither macroscopic observation nor histological studies indicated that initial infection occurred on the outer surface of the glumes. Infection originating on anthers or other degenerating tissues appeared to be the rule under the conditions of the experiments.

Susceptibility and resistance of wheat varieties to bunt, E. N. BRESSMAN (*Jour. Amer. Soc. Agron.*, 24 (1932), No. 4, pp. 249-255, fig. 1).—Nearly 200 varieties of wheat were subjected to inoculation at the Oregon Experiment Station to determine their reaction to *Tilletia tritici* and *T. levis*. The inoculum consisted of a mixture of equal parts of 10 physiologic forms of bunt. Many cases of 100 percent infection were obtained, and most varieties proved susceptible. The most resistant varieties in this trial were Quality, Ridit, Minard, Beloglina, Ashkof, Bacska, Iobred, Acme, Akrona, Arnautka, Nodak, and Velvet Don.—(*Courtesy Biol. Abs.*)

Effect of leaf rust infection on yield of certain varieties of wheat, C. O. JOHNSTON (*Jour. Amer. Soc. Agron.*, 23 (1931), No. 1, pp. 1-12).—In the greenhouse at the Kansas State Agricultural College the yield of the susceptible Malakof CI 4898 was reduced by *Puccinia triticina* 55.71 percent, while a reduction of 22.3 percent was noted for the resistant Fulhard CI 8257. In the susceptible variety the loss in yield was due principally to a reduction in the number of kernels produced, although there also was a slight reduction in the number of heads per plant and in the size of the individual kernels. The loss in yield in a resistant variety, such as Fulhard, probably is due to the killing of many of the green leaf cells. This is visibly expressed in the form of flecking.

No shriveling of the grain resulted from heavy leaf rust infection in the greenhouse. The seed from inoculated plants frequently contain many small kernels. These, however, were plump and well formed. Experiments conducted in the field with Prelude spring wheat and Turkey winter wheat substantiated the results in the greenhouse.

Partial control of rust in field plats by sulfur dusting at 2-day intervals during the late spring resulted in an increase of 1.7 bu. per acre for Prelude and 2.3 bu. per acre for Turkey. Field experiments also indicated that at least part of the reduction in yield due to leaf rust was caused by the smaller size of individual kernels of the infected plants.—(*Courtesy Biol. Abs.*)

Effect of sulfur dusting and spraying with sodium arsenate on the wheat crop [trans. title], V. I. (W. J.) LOBIK (*Izv. Sev. Kavkaz. Kraev. Sta. Zashch. Rast. (Bul. North Caucasian Plant Protect. Sta.)*, No. 6-7 (1930), pp. 163, 164; *Ger. abs.*, p. 164).—Infection with rust and *Septoria* being very insignificant in 1929, experiments were conducted to determine the direct effect of fungicides on the productivity of wheat (grain weight, etc.). Control sections received no treatment, and experimental sections were repeatedly dusted with sulfur or sprayed with sodium arsenate. Crops from the sections dusted with sulfur were almost equal to the controls, but sections sprayed with sodium arsenate gave a considerably lower crop.

Rust in wheat crops in South Australia, season, 1932-33, R. C. SCOTT (*Jour. Dept. Agr. So. Aust.*, 36 (1933), No. 10, pp. 1144, 1146, 1147).—A report of incidence of injury by *Puccinia graminis* and *P. triticina* in 7 regions, with data on comparative resistance of 17 wheat varieties showing Ford and Sword to be the 2 most resistant varieties in commercial cultivation in South Australia.

The wheats and smut [trans. title], M. GAUDINEAU (*Sélectionneur*, 2 (1933), No. 1, pp. 15-19).—The results of the author's tests showed that most cultivated varieties of wheat are susceptible to smut (*Tilletia tritici*). However, such wheats as Red Hussar and Martin Amber have marked resistance and give promise in obtaining resistant hybrids. Resistance to smut being variable according to the origin of infectious material, selection of varieties must be verified as to resistance before introduction into a new region.

Bacterial wilt of alfalfa, F. R. JONES (*Jour. Amer. Soc. Agron.*, 22 (1930), No. 6, pp. 568-572).—The bacteria enter the plant through wounds in the root or crown near the soil level and grow between the larger younger cells, chiefly in the rays, through the cambium, and into the vessels where they cause a plugging of the invaded vessels.

Field observations indicated that some regional strains contained large numbers of resistant or immune plants. A method of testing varieties and strains of alfalfa for wilt resistance is briefly described. Young plants were grown in the greenhouse. In the spring, the roots were artificially wounded by drawing a knife blade lightly twice down the root and then dipping the plants in a bacterial suspension. The plants were then transplanted to the field. Shoots and roots were sectioned late in the fall as a final check.

Preliminary studies by the above method strongly suggest a high degree of resistance in the Ladak, Hardistan, and Turkestan strains.—(*Courtesy Biol. Abs.*)

Spraying cantaloupes for the control of downy mildew and other diseases, F. VAN HALTERN (*Georgia Sta. Bul.* 175 (1933), pp. 53, figs. 6).—In addition to briefly describing powdery mildew, anthracnose, and *Macrosporium* leaf blight, the author presents a detailed account of studies of the life history of downy mildew, the most serious cucurbit disease in southern Georgia.

Downy mildew was found in the stem, leaf, leaf petiole, tendrils, and blossom peduncles. The incubation period varied from 12 or 13 days in cool weather to 4 days at optimum temperature. In air saturated with moisture sporulation occurred within the temperature range of 45° to 86° F., but would not occur in free water on the leaf. Germination of conidia took place between 34° and

80.6°, with the optimum between 66° and 70°, within which range only 51 minutes were needed. Conidia were destroyed by a few hours' exposure to dry, hot sunlight or at temperatures much above 86° even if in water.

The hypothesis is advanced that Florida serves as a perennial source of infection of downy mildew for Georgia and States farther north. Whenever cool and dry weather occur in Florida in early spring the development of mildew is retarded in the States to the north, often so late that the fungus causes no serious losses.

Of various spray concentrations tested, a Bordeaux mixture made up of 1 lb. of snowform copper sulfate, 2 lb. of hydrated lime, and 50 gal. of water applied at weekly intervals during the growing season gave satisfactory and economical control.

A destructive *Fusarium* wilt of muskmelons, J. G. LEACH (*U.S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 17 (1933), No. 2, p. 17*).—A wilt caused by a species of *Fusarium* closely resembling *F. niveum* was found in several localities in Minnesota. The author believes that the fungus may possibly be a physiologic form of the pathogen attacking watermelons.

Bacterial wilt of corn, F. V. RAND and L. C. CASH (*U.S. Dept. Agr., Tech. Bul. 362 (1933), pp. 31, pls. 3, figs. 2*).—Information obtained from an examination of corn specimens and of the pertinent literature suggested that bacterial wilt caused by *Aplanobacter stewartii* occurs primarily in the Middle and Southern States and is nonexistent or rare in the northern tier. Apparently transmission through the seed is the usual means of introducing the disease into new localities, but since the disease is carried within the seed external applications of disinfectants proved of no avail. Dry heat sterilization at temperatures well above the thermal death point of the bacterial organism killed all bacteria in laboratory tests without material injury to the seed itself. Commercial varieties of corn differed sharply in resistance, and in general the degree of resistance was roughly proportional to the length of time required for maturing.

Among external factors insects were found important in the dissemination of the disease, and in the Maryland area near Washington flea beetles were definitely shown to be responsible for its main summer spread, through secondary leaf infection by direct transfer of the organism. The 12-spotted cucumber beetle, although capable of harboring the organism in its alimentary tract over a considerable period, apparently was not an important spreading agent.

***Physalospora zeicola* on corn and its taxonomic and host relationships**, A. H. EDDINS and R. K. VOORHEES (*Phytopathology, 23 (1933), No. 1, pp. 63-72, figs. 2*).—A *Physalospora* found on cornstalks in Florida has been identified as *P. zeicola*, and it has been demonstrated that it produces an ear rot similar to that caused by *Diplodia frumenti*. Evidence is presented that *P. zeicola* is the perfect stage of *D. frumenti*. Since Stevens (*E.S.R.*, 59, p. 246) has shown that *P. rhodina* is the perfect stage of *D. natalensis* and *D. gossypina*, it is thought that it would be less confusing to refer to the fungus by its perfect-stage name whether it occurs on citrus or cotton. Ears of corn in the early stages of growth proved more susceptible to infection with *P. zeicola* than ears in the later stages of development. *P. zeicola*, *P. rhodina*, and *D. tubericola* grew and produced pycnidia on 31 host plants inoculated with mycelium from pure cultures obtained from pycnosporos of the imperfect stages of the three organisms.—(*Courtesy Biol. Abs.*)

Sclerotia-forming habits of the cotton root-rot fungus in Texas Black-Land soils, H. C. McNAMARA and D. R. HOOTON (*Jour. Agr. Res. [U.S.], 46 (1933), No. 9, pp. 807-819, figs. 5*).—The soil surrounding the first plants to die from cotton root rot fungus, *Phymatotrichum omnivorum*, on plats returned

to cotton after being in clean fallow or planted to nonsusceptible crops for several years, was examined and studied at Greenville and elsewhere in Texas. The extensive field examinations made during the summer and fall of 1931 gave evidence that the prolonged persistence of the disease in clean fallows and in plats planted to nonsusceptible crops is undoubtedly due to sclerotia formed below the plow slice and associated with various kinds of dead and decaying material such as tree stumps or old roots.

Where deep-seated infestations exist, control of root rot by clean fallows or nonsusceptible crops probably must be supplemented by tillage operations that will reach the sclerotia, usually found below the plow slice at depths of from 4 to 12 in.

Further notes on the nematodes associated with the soreshin of cotton, J. R. CHRISTIE and C. H. ARNDT (*U.S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 17 (1933), No. 1, pp. 10-12).—Numerous cotton seedlings were studied directly as collected from several fields in South Carolina in the spring of 1932 to obtain further information on the prevalence of various species of nemas in diseased seedlings. The preliminary results obtained indicated that various species of nematodes may cause the original injury through which fungi and bacteria invade the cortex, or if the nematodes do not initiate the lesions, they apparently are important agents in their enlargement.

Resistance of some of the cultivated species of *Allium* to pink root (*Phoma terrestris*), D. R. PORTER and H. A. JONES (*Phytopathology*, 23 (1933), No. 3, pp. 290-298, fig. 1).—Varieties of six species were tested at the University Farm at Davis, Calif., *A. fistulosum* (Nebuka type), *A. porrum* (leek, Giant Musselberg variety), and *A. schoenoprasum* (chives) proving extremely resistant. *A. sativum* (garlic), *A. ascalonicum* (shallot), and most varieties of *A. cepa* are extremely susceptible, although the variety Sweet Spanish may be classed as only moderately so.—(*Courtesy Biol. Abs.*)

Fusarium wilt of pea in California, W. C. SNYDER (*U.S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 17 (1933), No. 4, pp. 31, 32).—For the first time pea wilt caused by *F. orthoceras pisi* was observed in California pea fields, with the findings confirmed in the laboratory.

Effect of nitrate of potash on the vigor and productivity of healthy and leaf-roll Green Mountain potato plants and their progenies, O. BUTLER and H. L. MURRAY (*Jour. Amer. Soc. Agron.*, 24 (1932), No. 11, pp. 881-887; also *New Hampshire Sta. Sci. Contrib.* 38 (1932), pp. 881-887).—In a study on the effect of temperature on the growth and productivity of successive generations of healthy and leaf roll Green Mountain potatoes, potassium nitrate applied to certain cultures increased yields and also resulted in loss of vigor in the progeny of the fertilized plants. In the healthy plants the use of potassium nitrate in 1930 did not cause, per se, decreased productivity, although when associated with change in temperature from one season to the next a distinctly injurious effect was evident when fertilized plants were grown in 1930 at 20° C. and in 1931 at 15°. With the leaf roll plants, however, the response to potassium nitrate was little, if at all, affected by change in the temperature at which the plants were grown during 1931.

The toxicity of formaldehyde and mercuric chloride solutions on various sizes of sclerotia of *Rhizoctonia solani*, G. B. SANFORD and J. W. MARRITT (*Phytopathology*, 23 (1933), No. 3, pp. 271-280, fig. 1).—In the standard cold formaldehyde solution (1:240), 2 percent of the sclerotia of small size (1.5×0.2-0.4 mm) on the surface of potatoes, 19 percent of the medium size (2.5×0.5-0.7 mm), and 56 percent of the large size (3.5×0.8-1.5 mm) were viable after 2 hours. It required 390 minutes to kill the medium sclerotia and 480

minutes for the large ones. Stronger solutions were increasingly effective for all sizes. The lethal period for the small, medium, and large sizes (in 1:120 solutions) was 90, 180, and 270 minutes, respectively. The cold mercuric chloride (1:834) was more efficient than the cold formaldehyde solution used. The lethal period for the three sizes was about 60, 130, and 150 minutes, respectively. Acidulated mercuric chloride (1:500+1 percent by volume of hydrochloric acid) killed all the small sclerotia in 3 minutes and the medium ones in 5 minutes. Eight percent of the large were still viable after 5 minutes, and 2 percent after 13 minutes. The small sclerotia were killed in 1:834 solution, but a rather high percentage of the medium and large sizes grew. Where small and medium sclerotia are concerned, either acidulated or nonacidulated mercuric chloride was effective up to the fifth successive treatment and, for practical purposes, probably up to the eighth by extending treating time. Variability in texture of the sclerotia on any lot of potatoes or among different lots is often very marked, necessitating different treating periods in a given concentration. Under test conditions (one season) none of the following time-strength treatments perceptibly weakened the vitality of the stand: Cold formaldehyde 1:120 up to 240 minutes, 1:160 up to 310 minutes, 1:200 up to 390 minutes, and 1:240 up to 470 minutes; cold mercuric chloride 1:834 up to 120 minutes; and acidulated mercuric chloride 1:500 and 1:834 up to 8 and 15 minutes, respectively. From counts made on nine representative lots of potatoes, the proportion of small, medium, and large sclerotia was 13:3:1.—(Courtesy Biol. Abs.).

Ophiobolus oryzinus, the cause of a rice disease in Arkansas, E. C. TULLIS (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 9, pp. 799-806, fig. 1).—*O. oryzinus*, first discovered by C. F. Baker (E.S.R., 37, p. 148) on rotting rice straw in the Philippines, has been found to produce a rice disease in Arkansas. Inoculation experiments by the Arkansas Experiment Station and the U.S. Department of Agriculture showed that *O. oryzinus* is pathogenic on Fortuna and Blue Rose rice plants in seedling and in heading stages, and on red rice plants in the seedling stage. Infected plants failed to tiller normally, producing tillers only after the first culm headed. Invasion of the host occurs by direct mycelial penetration of the epidermis of the basal leaves, and appressoria are formed and aid in the invasion of tissues under basal leaves.

Transmission of cucumber mosaic to spinach, I. A. HOGGAN (*Phytopathology*, 20 (1930), No. 1, pp. 103-105, fig. 1).—It has been found in cooperative work by the Wisconsin Experiment Station and the U.S.D.A. Bureau of Plant Industry that cucumber mosaic is readily transmissible by the green peach aphid and the potato aphid to spinach, from which host the virus is again recoverable by the same agencies.

Some viruses affecting spinach, and certain aspects of insect transmission, I. A. HOGGAN (*Phytopathology*, 23 (1933), No. 5, pp. 446-474, figs. 5).—The author concludes that cucumber mosaic is readily transmissible to spinach, variety Bloomsdale, by artificial inoculation and by the green peach aphid and the potato aphid. No indication was obtained of any direct transmission of the cucumber mosaic virus from infective green peach parent aphids to their progeny. The evidence previously presented by McClintock and Smith (E.S.R., 39, p. 550) as indicating an inheritance of the spinach blight virus by successive generations of aphids is discussed in the light of the possible relationship between this disease and cucumber mosaic, and reasons are advanced for not accepting this evidence as conclusive in the absence of further confirmation.

The study is contributed from the Wisconsin Experiment Station and the U.S.D.A. Bureau of Plant Industry.

Fungi accompanying rotting as potential agents of root rot [trans. title], A. G. STEPANENKO-NEVODOVSKAÏA (*Trudy Nauch. Inst. Selek. (Contrib. Plant Breeding Inst.)*, 4 (1928), pp. 135-140).—Thirty species of micro-organisms were isolated from rotting sugar beet roots. Portions of a sterilized sugar beet decoction were mixed with pure cultures of some of them, and sugar beet seed was moistened with these mixtures previous to sowing. It was confirmed that *Phoma betae* actively causes root rot, while *Botrytis cinera*, *Jionnotes betae*, *Rhizopus betavora*, *Penicillium crustaceum*, *Fusarium betae*, and *Oospora* (collective sp.) are potential agents.—(Courtesy Biol. Abs.)

Artificial transmission of sugarcane mosaic, J. MATZ (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 9, pp. 821-839, fig. 1).—The current state of knowledge concerning the mosaic disease of sugarcane is reviewed, new results of inoculation tests with this mosaic are presented, and a new method of inoculation is described.

In inoculation tests on healthy plants of the mosaic-susceptible Black Amber sorgo and on the mosaic-susceptible sugarcane varieties, the extracted juice from slowly ground and not overheated pulp of foliage of mosaic-infected sugarcane was placed in the wedge-shaped opening between the expanded and tightly rolled youngest leaves in the spindle of healthy young sugarcane plants. Through the liquid in this wedge-shaped reservoir, a very fine needle was thrust repeatedly into the liquid-covered area of the rolled leaf. Thus the stabbing of the expanding tissue was done under the mosaic-infected liquid, which was allowed to remain in place until it was evaporated or absorbed. High percentages of infection were thus obtained with air-exposed infected extract, but it tended to lose its infectiveness increasingly in storage even at 4° C. (39.2° F.). This tendency, however, was largely overcome by solidly freezing the extract within 24 hours and storing it at -6°.

On the use of the primary lesions in quantitative work with two plant viruses, G. SAMUEL and J. G. BALD (*Ann. Appl. Biol.*, 20 (1933), No. 1, pp. 70-99, pl. 1, figs. 6).—In this study of the method of Holmes (*E.S.R.*, 65, pp. 750, 843), the viruses of tobacco mosaic 1 and tomato spotted wilt were inoculated on Blue Pryor tobacco seedlings, the seed for each series coming from a self-fertilized plant. The seedlings were sorted into uniform lots, grown in flower pots, and watered sometimes with soluble manures. The plants were trimmed to five leaves each a few days before inoculation. Wilt virus was secured from recently infected plants, and virus extractions more concentrated than 1 to 10 were washed off immediately after application. This increased infections, probably by avoiding toxic inocula. Ground glass spatulas or pieces of muslin were dipped in extracted viruses and rubbed once or twice on each leaf, and pairs of viruses for comparison were rubbed on opposite halves of each leaf. Determination of areas of leaves was found to be usually unnecessary with this half-leaf method. Squares of newspaper were held under leaves during the epiphyllous inoculations. Primary lesions of wilt appeared in tobacco within 6 to 8 days. Iodine revealed nonnecrotic lesions.

All data were analyzed statistically. The test for significance was that a difference should exceed twice the standard error. Stunted and chlorotic tobacco plants were less susceptible than normal ones to mosaic, and mathematical corrections were made for differences in areas of leaves. Etiolated parts of leaves produced more lesions than normal parts. Concentration of wilt virus in tobacco increased during the first 5 days of infection and decreased later. Its concentration in tomato decreased after 2 weeks of infection. In contrast to tobacco mosaic 1, wilt virus became nonvirulent within 2 hours after extraction from leaves. Ground sieved sand in inocula increased infec-

tions with yellow tobacco mosaic in three species of *Nicotiana*.—(Courtesy Biol. Abs.)

Rod-shaped particles in tobacco mosaic virus demonstrated by stream double refraction, W. N. TAKAHASHI and T. E. RAWLINS (*Science*, 77 (1933), No. 1984, pp. 26, 27, figs. 2).—By use of polarized light in an apparatus described, the authors have demonstrated at the University of California the occurrence of stream double refraction in juice of mosaic tobacco plants, its absence in the juice of healthy plants, and its similarity to the stream double refraction shown by sols containing rod-shaped particles. This indicates that the virus of tobacco mosaic, or some substance regularly associated with it, is composed of rod-shaped particles.

Stream double refraction exhibited by juice from both healthy and mosaic tobacco plants, W. N. TAKAHASHI and T. E. RAWLINS (*Science*, 77 (1933), No. 1994, p. 284).—Continuing the above work, the present evidence is considered insufficient to warrant conclusions as to whether the virus particles are or are not responsible for all or part of the double refraction exhibited by juice from diseased plants.

The movement of tobacco mosaic virus in its host, J. GRAINGER (*Ann. Appl. Biol.*, 20 (1933), No. 2, pp. 236-257, figs. 5).—Experiments on the rate of spread of the virus of tobacco mosaic in the leaves and stems of *Nicotiana tabacum* (Connecticut Havana No. 132), conducted at the Universities of Leeds and Wisconsin, showed that it moves at a logarithmic rate, beginning slowly and later accelerating. The spread seemed independent of mechanical carriage by the transpiration or translocation streams, and could take place in parenchyma. The virus multiplied in tissue near to the point of inoculation at a logarithmic rate portrayed by an S-curve, which is also typical of the growth of living organisms and of the rate of accumulation of the catalyst in an autocatalytic reaction. While naturally produced water of guttation from diseased tomato plants did not carry virus infection, the application of high pressures ruptured the cells of the leaf and gave an infectious liquid.

A few remarks regarding the eradication of the disease known as wild fire in the tobacco plantations in the Yamaska Valley, R. BOBDELEAU (*Quebec Soc. Protect. Plants Ann. Rpt.*, 23-24 (1930-32), pp. 173-176).—Control of *Bacterium tabacum* involved disinfection of the curing barns, laths, machinery, and tools used in tobacco production, as well as seed bed frames, sashes, and molding, with 1:50 formalin. General application of this treatment after the bad outbreak of 1928 resulted in disappearance of the disease in 1931-32.—(Courtesy Biol. Abs.)

The anatomy of the "kroepoek-diseased" leaf of *Nicotiana tabacum* and of *Zinnia elegans*, L. C. P. KERLING (*Phytopathology*, 23 (1933), No. 2, pp. 175-190, figs. 10).—The two types of kroepoek of tobacco differ not only externally but also anatomically, although they are transferred by the same *Bemisia* sp. (Aleurodidae). The permanence of the two separate types in infection experiments indicates that two different viruses are concerned. The common kroepoek of tobacco and the kroepoek of zinnia also agree in many respects, and the zinnia virus can be transferred to tobacco by Aleurodidae.—(Courtesy Biol. Abs.)

Studies on gummosis [trans. title], A. CURINI-GALLETTI (*Riv. Patol. Veg.*, 22 (1932), No. 1-2, pp. 11-17).—Repeated tests indicate the presence of diastase, cytase, and cellulase in the gummy exudate from plum, cherry, apple, and peach trees. It is held that organisms are not the direct cause of this disease but may act indirectly by producing enzymes which arrest cicatrization, accelerate cell necrosis, and facilitate entry of oxygen into the invaded tissue. To

arrest the disease, the application of ferrous sulfate to clean wounds and subsequent coating with tar to exclude air are advised.—(*Courtesy Biol. Abs.*)

Aspergillus sclerotiorum, n. sp., and its relation to decay of apples, G. A. HUBER (*Phytopathology*, 23 (1933), No. 3, pp. 306–308, fig. 1).—This study, carried on at the Washington College Experiment Station, indicated that *A. sclerotiorum* belongs to the *A. ochraceus* group, sulphureus series, and is pathogenic to apples at both ordinary and cold-storage temperatures. When inoculated into sound, ripe Jonathan apples it produced lesions 42–46 mm in diameter in 42 days at 22°–25° C., 28–38 mm in diameter in 90 days at 6°–8°, and 10–14 mm in diameter in 120 days at 0°–2°.—(*Courtesy Biol. Abs.*)

A comparative histological study of crown gall and wound callus on apple, E. P. SYLWESTER and M. C. COUNTRYMAN (*Amer. Jour. Bot.*, 20 (1933), No. 5, pp. 328–340, pls. 2, figs. 7).—Seeking to establish diagnostic differences between the nonpathogenic callus tissues and crown gall of grafted trees, studies were made at the Iowa State College of the structure of both tissues. In each the overgrowth consisted of proliferated host tissue derived from cells external to the xylem cylinder. Within the parenchymatous overgrowth there were meristematic islands in the form of isolated spheres, whorls, or sheets of cells which underwent centrifugal differentiation into lignified contorted xylem elements. Meristematic activity in any given island ceased in about three weeks, but new islands arose progressively in the margin.

Crown gall differed from callus knot in that sclerenchyma cells were common in the former, and near the surface there was usually a zone of dark, polygonal, close-fitting cells distinct from the surrounding parenchyma. The test for tannin was positive in the crown gall and negative in the callus tissue. No evidence was found of the occurrence of the crown gall organism in living cells, but such was found abundantly on the surface of galls, in the schizogenous cavities, and in partly disorganized cells near the surface.

Further studies on the overwintering and dissemination of the fire-blight pathogen, H. R. ROSEN (*Arkansas Sta. Bul.* 283 (1933), pp. 102, figs. 30).—In further studies (E.S.R., 62, p. 444) extensive observations in commercial orchards of susceptible apple varieties failed to reveal any bacterial exudates prior to the outbreak of new infections in the spring. No consistent correlation could be established between the amount of blight one year and that of the succeeding year. That rainfall is not necessarily an important factor in the development of blossom blight was indicated by observations in the extremely dry spring of 1930 when blossom blight was very prevalent and destructive despite the absence of rains during the blooming period.

Although blossoms of pear and apple are usually the first organs to show infection, inoculations in the greenhouse and field showed that young leaves are fully as susceptible and that infection of flowers or leaves may be secured by simply spraying the inoculum in a manner simulating rain. In the absence of rains or low temperatures which limit insect movement, initial infections were restricted to the flowers, suggesting that the pathogen was distributed by insects. Fire blight may also originate in other ways, (1) as internal extensions of preceding season infections, (2) as bud infections in buds attacked but not killed the preceding year, (3) as infections arising from bacterial exudates produced the preceding season, and (4) as twig blight induced by inoculum from overwintering cankers.

Some indication was found that the fire blight pathogen may overwinter or oversummer in the beehive. Various insects, including mealybugs and aphids, were found associated with fresh blight but upon laboratory examination showed no evidence of carrying the pathogen.

Studies of the mode of entrance into twigs under natural conditions indicated that twig blight starts mainly on the stems rather than the leaves, and that entrance is accomplished sometimes by direct stomatal penetration, often near the leaf axils. Mechanical injuries are believed to play an important role in blight entrance. Under certain conditions Bordeaux mixture applied twice during the blossoming period in dilute concentrations offered considerable promise as a means of reducing blossom blight.

Infectious variegation in the apple, F. C. BRADFORD and L. JOLEY (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 10, pp. 901-908, fig. 1).—Appearing as an unexpected complication in a study at the Michigan Experiment Station of double working of pears and apples, this leaf variegation, characterized by small, irregular spots of yellow or creamy white, was found to be transmitted from scion to stock and also from stock to scion. That the disease does not spread from tree to tree was indicated in the fact that trees not grafted to the affected variety (Steele) but intermingled with such trees did in no instance develop the disease. That the infection may lie latent or at least be masked in certain instances was indicated in the fact that buds taken from a mature Steele tree in the college orchard developed variegation in the stocks on which they were grafted, despite the fact that an examination of the parent tree showed no variegation. In addition to the Steele variety, disease was observed in the Marks and an unknown sort. The ultimate effect of the disease on the apple tree was not established.

Apple-scab spore development and sprays, W. D. VALLEAU (*Ky. State Hort. Soc. Trans.*, 1932, pp. 73-79).—From a study of spore development made during the spring of 1932, from the experience of growers in previous years, and from studies of spore development in other regions, it is concluded that it would be an extremely dangerous practice in Kentucky to base a spray program for scab control on a microscopic examination of the developing ascospores. It is far safer to assume that at the time apple trees are budding during the spring scab spores are also developing, and that during every rain in the prebloom period some scab spores will be discharged. Consequently, protective sprays should always be applied during this period unless no rain falls.

Why was apple scab so hard to control in 1931? O. C. BOYD (*Mass. Fruit Growers' Assoc. Rpt.*, 38 (1932), pp. 143-148).—In this paper from the Massachusetts State College the following factors were listed, in the order of their relative importance, as accounting for the unusually heavy damage from scab in 1931: (1) A lack of thoroughness in spraying and dusting; (2) unusually favorable weather for both primary infection and secondary spread; (3) a heavy supply of inoculum for primary infection in some orchards from old spotted leaves under the trees where late infection of scab on foliage had not been prevented the preceding season; (4) the failure to continue spraying or dusting late enough in the season; (5) too long intervals between the pink and calyx sprays, due to poor timing of those applications; and (6) the excessive washing of spray and dust deposits from the trees, due to the unusual rainfall throughout the season.

Tests of liquid lime-sulfur and sulfur dust are briefly noted.

A superficial spotting disease of the Lord Wolseley apple, L. W. TILLER (*New Zeal. Jour. Sci. and Technol.*, 14 (1932), No. 2, pp. 111-113, fig. 1).—A spotting disease brought about under the action of light is greatly reduced by storage at 32° F. instead of at higher temperatures. Late picked fruits are especially susceptible, and oiled wrappers afford only partial control. In this respect the disease is similar to Jonathan spot. Other varieties on which a

similar spotting has been produced under the action of light are Cleopatra, Granny Smith, London Pippin, and Cox Orange Pippin. The stalk end of the apple is generally more severely affected than the calyx end. The spotting is a photochemical, not a temperature, effect.—(*Courtesy Biol. Abs.*)

The tastelessness which accompanies the "male raggiante" of peaches in cold storage [trans. title], F. SCURTI and G. L. PAVARINO (*R. Staz. Chim. Agr. Torino Ann.*, 11 (1929-31), pp. 11-29, pls. 11).—The varieties San Martino, Salway, and Hale are affected by male raggiante (E.S.R., 67, p. 414) in cold storage. Physiological alteration may occur in peaches stored up to 8° C. In affected fruit the pectic compounds lose their solubility properties in the cell juices, due to the decrease of sugar compounds, and accumulate in the intercellular spaces, thus arresting air circulation. Cellular asphyxiation, together with plasmolysis and browning, then takes place, due to abnormal respiration. As the disease progresses the pectic compounds accumulate, break down, and bring other changes in the cells. The phenomenon of tastelessness is associated with this process.—(*Courtesy Biol. Abs.*)

Grafting as a method for investigating a possible virus disease of the strawberry, R. V. HARRIS (*Jour. Pomol. and Hort. Sci.*, 10 (1932), No. 1, pp. 35-41, pl. 1, figs. 2).—In order to investigate the possible virus nature of a disease of the strawberry similar to the yellows or xanthosis described by Plakidas (E.S.R., 58, p. 152; 59, p. 53) without infesting the plants with potential insect vectors or introducing the complicating factor of insect feeding injury, experiments to determine the possibility of grafting strawberry plants were carried out at the East Malling Research Station, Kent, using the variety Royal Sovereign. Attempts to graft the main crowns were unsuccessful, but it was found possible to cleftgraft or inarch the stolons. The methods used are described in detail.—(*Courtesy Biol. Abs.*)

On Botrytis tip-end rot of banana fruits in Palestine [trans. title], I. REICHERT and E. HELLINGER (*Hadar*, 5 (1932), No. 7, pp. 147-150, figs. 2; *Eng. abs.*, pp. 162, 163).—An account is given of a new banana fruit rot caused by *B. cinerea*. Intact, as well as wounded, fruits were infected.

Suggestions for control are given, and the danger confronting citrus culture in the spread of this banana disease is pointed out.—(*Courtesy Biol. Abs.*)

Pitting disease of bananas: Its nature and control, C. W. WARDLAW and L. P. MCGUIRE (*Trop. Agr. [Trinidad]*, 9 (1932), No. 6, pp. 193-195).—This paper describes the nature of pitting or spotting disease of cushions and finger stalks of bananas, which is one of the principal sources of wastage in Brazilian banana cargoes. It may be controlled by removing "transition" leaves and bracts before they become subject to infection by fungi whose spores, during moist weather, will drip on the uppermost hands of the bunch.—(*Courtesy Biol. Abs.*)

Probable role of potash fertilization against rots of citrus fruits [trans. title], F. GIOELLI (*Riv. Patol. Veg.*, 22 (1932), No. 7-8, pp. 189-193).—Samples of oranges were collected from trees in plats fertilized with different materials in the Province of Catania. The fruits were wounded and inoculated with a spore suspension of *Penicillium digitatum*. The fruit from a plat fertilized exclusively with potash and from a plat fertilized with iron sulfate rotted less rapidly than fruit from plats which received nitrogenous fertilizers.—(*Courtesy Biol. Abs.*)

Some storage and transportational diseases of citrus fruits apparently due to suboxidation, R. NELSON (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 8, pp. 695-713, pls. 6).—Using fruits obtained in the open market, storage spot and brown spot were produced in the laboratory of the Michigan Experiment Sta-

tion under various conditions of air composition, and typical symptoms were produced by storing susceptible varieties in nitrogen for from 4 to 10 days. At room temperature air movement without renewal was not adequate to prevent spotting. As regards the effect of temperature, spotting was produced in immature green skinned fruits stored for from 10 to 14 days at temperatures close to 32° F. in an atmosphere containing sufficient oxygen. Immaturity of both oranges and grapefruit increased their susceptibility to spotting.

In most instances oiled wrappers failed to decrease the amount of disease on either grapefruit or oranges held at low temperature. The dilute vapors of various chemicals, particularly citral, induced injury on oranges similar to brown stain, a disease comparable to apple scald in that the surface cells were injured. Oranges and grapefruit exposed to vapors of acetaldehyde, acetic acid, or a mixture of the two developed lesions similar to brown and storage spots. Brown and storage spots seemed to originate in an injury to the parenchyma cells surrounding the oil vesicles. The author suggests that some substance having a similar action on the fruit as has acetaldehyde and fruit esters may be concerned in the injury.

Prevent mould decay in oranges, R. J. BENTON (*Agr. Gaz. N.S. Wales*, 44 (1933), No. 6, pp. 451-454, figs. 2).—Experiments carried out over several seasons demonstrated that most of the loss from green mold (*Penicillium digitatum*) can be prevented by immersing the fruit in a borax or bicarbonate of soda solution. Certain proprietary substances were also tested, and of these one said to be used in Californian packing houses gave promising results.

List of ornamental flowering plants naturally infected with curly top or yellows diseases in California, H. H. P. SEVERIN and J. H. FREITAG (*U.S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 17 (1933), No. 1, pp. 1, 2).—Fifteen species of ornamental flowering plants in 14 genera belonging to 11 families were found to be infected naturally with curly top in California.

List of ornamental flowering plants experimentally infected with curly top, J. H. FREITAG and H. H. P. SEVERIN (*U.S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 17 (1933), No. 1, pp. 2-5).—The curly top disease of sugar beets was transmitted experimentally under greenhouse conditions by the beet leafhopper to 90 listed species of ornamental flowering plants in 72 genera belonging to 33 families.

Studies on mosaic and related diseases of dahlia, P. BRIERLEY (*Contrib Boyce Thompson Inst.*, 5 (1933), No. 2, pp. 235-288, figs. 16).—A total of four virus diseases, namely, mosaic, ring spot, yellow ring spot, and oakleaf, are described with special emphasis on the first, which was found common in the Connecticut, New York, and New Jersey area. Dahlia mosaic was manifested in chlorotic bands correlated with the veins, leaf distortion, shortening of internodes and flower stems, and vein necrosis. Varieties differed markedly in their tolerance, extreme susceptibility being manifested in stunting, a condition for which insects seem partly responsible. Mosaic was not found in true seed, nor was the virus transmitted by mechanical means. The aphid *Myzus persicae* was found to be a vector, although it did not seem to prefer dahlia as a food plant. None of the other insects tested was found capable of transmitting the disease. After inoculation a period of from 4 to 6 weeks was usually needed to show symptoms. No other plant except the dahlia was found susceptible to mosaic, and control was said to lie in the selection and isolation of disease-free stock.

A new virus disease of delphinium in Idaho, C. W. HUNGERFORD (*U.S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 17 (1933), No. 1, p. 5).—Brief mention is made by the Idaho Experiment Station of an apparently previously

unreported disease of the cultivated delphinium. The symptoms include an excessive proliferation of the flower stalk and marked dwarfing of the leaves, petioles, and aborted flower parts. The disease is believed to be of virus nature, and the destruction of infected plants proved effective in cleaning up plantings.

Downy mildew of Meconopsis (*Peronospora arborescens*), N. L. ALCOCK (*New Flora and Silva*, 5 (1933), No. 4, pp. 279-282, pl. 1, fig. 1).—*P. arborescens*, downy mildew of poppy, is reported as a serious disease also of *Meconopsis*. Light brown or yellow blotches occur on the upper side of the leaf, turning brown or black later, and the under side of the blotch is covered with a white or gray down. This disease is also found in the buds, calyxes, and seed vessels and on the seeds. It overwinters in scraps of diseased tissue. The destruction of such material is advocated, and likewise the removal of diseased seedlings before transplanting.

Rose diseases and insects and their control, H. T. COOK and H. G. WALKER (*Virginia Truck Sta. Bul.* 79 (1932), pp. 1051-1066, figs. 6).—This is a presentation of general information regarding the control or prevention of such troubles as powdery mildew, black spot, anthracnose, brown canker, crown gall, cane borers, scales, aphids, thrips, rose beetles, etc. The preparation of various fungicides and insecticides used in the control of rose pests is discussed.

Methods of phytopathological investigation of the seed of various species of trees [trans. title], S. I. VANIN and E. M. KOCHKINA (KOTCHKIN) (*Izv. Leningrad. Inst. Vred. Selsk. i Lesnom Khoz. (Bul. Leningrad Inst. Control. Farm and Forest Pests)*, 2 (1932), pp. 285-297, figs. 4; *Eng. abs.*, pp. 296, 297).—The authors recommend two methods for determining the species of fungi occurring on the surface and inside the seed of trees, as well as the degree of infection.

(1) In the germination method 100 seeds from an average seed sample are placed in 4 Petri dishes (25 in each) on agar medium and kept in a thermostat at from 20° to 25° C. Qualitative and partly quantitative determinations of the species of fungi on the seed are made possible when the spores produce mycelia. For determining the fungi the mycelia of which are inside the seed, the latter are sterilized with 0.15 percent formaldehyde and split into halves, which are placed in a Petri dish containing nutrient medium on which the mycelia present in the seed grow profusely.

(2) In the decanting (pouring off) method from 10 to 20 seed are rinsed in a definite quantity of sterile water, a part of which is poured off into Petri dishes containing nutrient agar medium. The number of spores present on the seed is computed by the following formula: $N = n \cdot \frac{V}{v}$, where N = the number of viable spores on the seed, n = the number of spores which have germinated in the Petri dish, V = the quantity of water used for rinsing the seed, and v = the quantity of water poured off into the Petri dish. The determination of the number of viable spores of each species (N_1) can be computed according to the same formula by substituting N with N_1 and n with n_1 (number of germinated spores of each species). Species of fungi which were found to infect seed of various trees are listed.—(*Courtesy Biol. Abs.*)

Crown gall on a conifer, J. G. BROWN and M. M. EVANS (*Phytopathology*, 23 (1933), No. 1, pp. 97-101, figs. 2).—In this contribution from the University of Arizona, crown gall on the roots of *Cupressus arizonica*, believed to be the first reported case of *Phytoplasma tumefaciens* on a conifer, is described with respect to the nature of the galls, the reaction of the bacterium on culture media, and the result of cross inoculations into *Ricinus communis*.—(*Courtesy Biol. Abs.*)

Work on Japanese-American hybrids during 1932, A. H. GRAVES (*Brooklyn Bot. Gard. Rec.*, 22 (1933), No. 2, pp. 57-63, fig. 1).—Details of germination and growth records of hybrid chestnut (*Castanea* spp.) seedlings are given. One notable instance of heterosis is cited.—(*Courtesy Biol. Abs.*)

A disease of Colorado fir, A. M. WATERMAN and M. A. MCKENZIE (*Phytopathology*, 23 (1933), No. 1, pp. 108, 109).—Conspicuous in a planting of some 500 trees of *Abies concolor* in eastern Massachusetts was *Rehmiellopsis bohémica*, which caused the needles to become reddish and shriveled, followed in midsummer by a second growth of stunted and malformed leaves. An *Abies* sp. in New York was also found to be affected.—(*Courtesy Biol. Abs.*)

Transmissibility of the brooming disease of black locust, L. W. R. JACKSON and C. HARTLEY (*Phytopathology*, 23 (1933), No. 1, pp. 83-90, figs. 2).—This disease of *Robinia pseudacacia* has been successfully transmitted in one case to healthy stocks through grafting of diseased stem scions despite the death of the scion. In certain cases the disease failed of transmission despite the union and growth of the scion. Brooming appeared on the stocks, during the first season, in some cases nearly 3 ft. from the graft. The time requirement for visible evidence of transmission was from 4 to 5 months.—(*Courtesy Biol. Abs.*)

Method of determining age of blister rust infection on western white pine, H. G. LACHMUND (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 8, pp. 675-693, fig. 1).—Knowing that *Cronartium ribicola* infects its aecial hosts through the needles and observing that *Pinus monticola* in its natural range in the Pacific Northwest generally holds any one year's growth of needles for four subsequent seasons, with some persisting even to the eighth year, the author made determinations of the number of blister rust cankers associated with the different aged nodes. The maximum number of cankers, 53 and 31 percent, respectively, were found on second and third year growths, with relatively few cankers in the first and fourth seasons and very few in the fifth. Heavy infection of pines in any given year was manifested the second season following the date of infection by a more or less distinct wave of incipient canker formation. However, incipient infection sometimes carried over into the third season and thus complicated deductions as to the year of origin. Conditions favorable to heavy pine infection were fortunately limited to a short period in any one season and occurred on the average only about one in every three years. The classification of cankers according to the stage of development and the year's growth attacked generally permitted an accurate determination of the main infection years and revealed the rapidity of progress of the disease in any infection area.

Field inoculations of *Pinus strobus* with sporidia of *Cronartium ribicola* in Minnesota, R. M. LINDGREN and A. D. CHAPMAN (*Phytopathology*, 23 (1933), No. 1, pp. 105-107).—In this study, carried on by the Minnesota Experiment Station, white pines, 3 to 7 years old, growing in two stations, were inoculated with sporidia from *Ribes nigrum* and *R. cynosbati*. The former affected 23 branches on 8 out of 9 trees and the latter 1 branch on 1 out of 9 trees.—(*Courtesy Biol. Abs.*)

Regeneration in second year of *Pinus silvestris* seedlings infected with *Lophodermium pinastri* when one year old [trans. title], A. KALANDRA (*Lesnická Práce (Œuvre Forest.)*, 12 (1933), No. 1, pp. 29-35, figs. 3; *Ger. abs.*, p. 35).—Some of the infected seedlings were transplanted to the nursery at the end of the first year; others were left in the seed beds during the second year; and their fitness as silvicultural material was then studied. Seedlings with terminal buds destroyed, or with the upper part of the axis dead, developed

into weak, scrubby plants. Infected seedlings with healthy terminal buds developed satisfactorily.—(*Courtesy Biol. Abs.*)

Contributions to the knowledge of the sap stains of wood in Japan.—I, Studies on *Ceratostomella ips* Rumbold, the cause of a blue stain of pine trees in western Japan, Y. NISIKADO and K. YAMAUTI (*Ber. Ōhara Inst. Landw. Forsch.*, 5 (1933), No. 4, pp. 501–538, pls. 12, fig. 1).—After an introduction and a historical review, the authors take up the general features of the blue stained wood on pines and give an extended account of the blue staining fungus, namely, *C. ips*, which is the cause of the death of *Pinus densiflora* and *P. thunbergii* in Japan. The details are presented in tabular form, and a list of 15 references to the literature is included.

Decay of wood and growth of some Hymenomycetes as affected by temperature, R. M. LINDGREN (*Phytopathology*, 23 (1933), No. 1, pp. 73–81, figs. 2).—The effect of temperature on the rate of wood decay and of mycelial growth on culture media was studied at the Minnesota Experiment Station under controlled conditions for *Lenzites sepiaria*, *Polystictus versicolor*, and *Lentinus tigrinus*. The cardinal temperatures for mycelial growth were approximately as follows: *Lenzites sepiaria*, 5°, 32°–35°, and 45° C.; *Lentinus tigrinus*, 7°, 32°–35°, and 43°; *P. versicolor*, 0°, 27°–32°, and 40°. Decay caused by *Lenzites sepiaria* and *P. versicolor* progressed most rapidly at those temperatures most favorable for their mycelial growth on culture media. Decay induced by *Lentinus tigrinus* was most rapid at 27°, while greatest mycelial development occurred at 32°–35°. At 22° decay processes, as well as growth of mycelium, were materially retarded for all three organisms.—(*Courtesy Biol. Abs.*)

On the biology of *Merulius lacrymans* and *Coniophora cerebella* [trans. title], S. I. VANIN and N. N. VLADIMIRSKAÏA (VLADIMIRSKY) (*Izv. Leningrad. Inst. Vred. Selsk. i Lesnom Khoz.*) (*Bul. Leningrad Inst. Control. Farm and Forest Pests*), 3 (1932), pp. 57–74, figs. 4; *Eng. abs.*, pp. 73, 74).—In mixed cultures of *M. lacrymans* and *C. cerebella* growth passed through three phases: (1) The mycelia of both species grew without interfering with each other, (2) a marked depression began in the growth of the mycelium of *C. cerebella*, and (3) the mycelium of *M. lacrymans* outgrew that of *C. cerebella*, causing a considerable depression of the latter. Under the influence of both, fungi wood decay proceeds at the same rate as under the influence of only one. A moderate amount of oxygen was necessary for growth of both species.

At reduced pressure (17 mm Hg), *M. lacrymans* did not grow, and *C. cerebella* was retarded. Nineteen days' exposure to such conditions brought about the loss of viability in the former, but not in the latter. At a pressure of 33 mm, *M. lacrymans* developed only half as rapidly as under normal conditions, and *C. cerebella* was not affected by these conditions. The mycelium of *M. lacrymans* perished after 1 hour at 40° C., after 20 minutes at 60°, and after 3 hours at –20°. The mycelium of *C. cerebella* withstood these conditions, also 3 hours at –30°, perishing only at 60°. *Fomes igniarius*, *F. fomentarius* and *Daedalea quercina* were more resistant to high temperatures than *Polyporus destructor* and *Poria vaporaria*. Wood infected with fungi and partially imbedded in concrete decayed even in the part surrounded by the latter, indicating that concrete does not retard fungal development. The mycelium of *M. lacrymans* penetrated concrete through its natural pores to a depth of 1 cm.—(*Courtesy Biol. Abs.*)

The effect of certain fillers on the development of *Merulius lacrymans* and *Coniophora cerebella* in the timber of buildings [trans. title], S. I. VANIN and N. N. VLADIMIRSKAÏA (VLADIMIRSKY) (*Izv. Leningrad. Inst. Vred. Selsk. i Lesnom Khoz.*) (*Bul. Leningrad Inst. Control. Farm and Forest Pests*),

3 (1932), pp. 39-43; *Eng. abs.*, p. 43).—Experiments showed that fillers having a high moisture capacity and affording nutrient media are the most favorable for the development of fungi. For the development of *M. lacrymans*, earth, clay, and sand used as fillers were more favorable than slag and building refuse, whereas gravel was quite unfavorable. Optimum conditions for the penetration of mycelia into the fillers prevail when the humidity of the surrounding air is about 100 percent.—(*Courtesy Biol. Abs.*)

On the effect of wood-destroying fungi on wood coated with paints and varnishes [trans. title], S. I. VANIN, I. E. ANDREEV (ANDREÏEV), and D. V. SOKOLOV (*Izv. Leningrad. Inst. Vred. Selsk. i Lesnom Khoz. (Bul. Leningrad Inst. Control. Farm and Forest Pests)*, 3 (1932), pp. 45-56, figs. 2; *Eng. abs.*, pp. 55, 56).—Wood samples coated with white lead, white zinc, red colcothar, iron minium, ocher, oil varnish, alcohol varnish, drying oil, nitrocellulose varnish, and creosote were inoculated with *Merulius lacrymans*, *Coniophora cerebella*, and *Fomes pinicola*. Three months after the injection the samples impregnated and coated with creosote were intact, whereas those coated with paints and varnishes showed different degrees of destruction by the fungi, although the damage was less than in the noncoated controls. The authors believe that the experiments showed that coating with paint results in a certain preserving action against wood-destroying fungi. Experiments in growing the fungi on a thin layer of agar poured over a film of paint or varnish showed that this preserving action of paints and varnishes (with the exception of alcohol varnish) is due not to the chemical effect on the fungi but to the mechanical properties of the paint or varnish film. Experiments showed that painting decreases the moisture capacity and hygroscopicity of wood. The difference in moisture capacity and hygroscopicity of painted samples can be explained by the difference in the density and moisture capacity of the layer of paint.—(*Courtesy Biol. Abs.*)

A list of plants attacked by the root knot nematode (*Heterodera marioni*), compiled by E. M. BUHRER, C. COOPER, and G. STEINER (*U.S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 17 (1933), No. 7, pp. 64-96).—A total of 855 host plants are listed alphabetically under their botanical and also horticultural names where available.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Fauna of the national parks of the United States: A preliminary survey of faunal relations in national parks, G. M. WRIGHT, J. S. DIXON, and B. H. THOMPSON (*U.S. Dept. Int., Natl. Park Serv., Fauna Ser. No. 1* (1932), pp. IV+157, figs. 56).—This contribution considers the approach to wild-life administration, methods adapted to faunal investigations in national parks, analysis of major types of faunal problems—their causes and treatment, conspectus of wild-life problems of each park, and suggested national park policy for the vertebrates.

Range conditions in the Wood Buffalo Park of western Canada, with notes on the history of the wood bison, H. M. RAUP (*Amer. Com. Internatl. Wild Life Protect., Spec. Pub.*, 1 (1933), No. 2, pp. 52, pl. 1).—This contribution first gives a historical summary and description of the range, followed by an account of the habits and distribution of the buffalo, a note for prospective travelers, and an annotated list (1) of the more important forage plants and (2) of plants known or thought to be injurious to grazing stock. A bibliography of 99 titles is included.

Muskrat investigations (*Maryland Sta. Rpt. 1932*, p. XXIV).—A brief statement is given of the progress of a study being made of the habits of the musk-

rat carried on in cooperation with the Maryland State Conservation Commission and the U.S. Department of Agriculture.

Canned red squill rat baits, M. G. O'CONNOR and E. M. MILLS (*Massachusetts Sta. Bul.* 293 (1933), p. 43).—Brief reference is made to tests of toxic baits for rats by the U.S.D.A. Bureau of Biological Survey (E.S.R., 67, p. 420) in which beef or horse meat, whiting, mackerel, haddock, and cereals were mixed with red squill powder and canned.

The nidification of birds of the Indian Empire, I, E. C. S. BAKER (*London: Taylor and Francis*, 1932, pp. XXIII+470, pls. 8).—This volume includes notes on the nidification of all those families of birds contained in the author's first bird volume of the Fauna of British India (E.S.R., 56, p. 551), plus the Cinclidae which commences the second volume. The families dealt with are the Corvidae, or crow family; Paridae, or titmice; Paradoxornithidae, or parrot bills, formerly known as crow tits; Sittidae, or nuthatches; Timaliidae, or babblers and laughing thrushes; Pycnonotidae, or bulbuls; Certhiidae, or tree creepers; Troglodytidae, or wrens; and Cinclidae, or dippers. The total number of individual species and subspecies dealt with in the "Fauna" belonging to these families was 480, and, since that volume was written, more races have been recognized, giving a gross total of 494.

The eagle, king of birds, and his kin, A. WETMORE (*Natl. Geogr. Mag.*, 64 (1933), No. 1, pp. 43-95, pls. 16, figs. 23).—This contribution, illustrated with paintings from life by A. Brooks, is the fifth of a series of paintings descriptive of all important families of birds of North America (E.S.R., 69, p. 381).

Relations between the sexes in song sparrows, M. M. NICE (*Wilson Bul.* 45 (1933), No. 2, pp. 51-59).—This contribution reporting observations conducted by the author is presented in connection with a list of 17 references to the literature.

The wintering of the Wisconsin bobwhite, P. L. ERRINGTON (*Wis. Acad. Sci., Arts, and Letters, Trans.*, 28 (1933), pp. 1-35, figs. 3).—This is a report of observations made during three seasons' field research, from 1929 to 1932, with a view to determining just how bobwhite coveys normally winter. During this period approximately 2,650 quail in 155 coveys were located, of which about 1,600 were kept under regular observation—400 from October 1929 to March 1930, 500 from December 1930 to March 1931, and 700 from December 1931 to March 1932. The results of the observations are reported in detail. The relation of food, cold, and snow to winter quail losses in southern Wisconsin in the winters of 1929-30 and 1931-32 and a comparison of 1929-30 and 1930-31 winter quail losses in identical areas in southern Wisconsin are graphically shown in chart form. Earlier accounts from the Wisconsin Experiment Station have been noted (E.S.R., 67, p. 704).

Attracting winter birds to the garden and home grounds, L. A. HAUSMAN (*New Jersey Stas. Bul.* 553 (1933), pp. 32, figs. 32).—The birds of New Jersey, foods for winter feeding stations, methods of offering food at a feeding station, storm and roosting shelters, bird baths, and plantings which attract birds are briefly considered, and several publications on the subject of attracting birds are listed.

Anatomical and ecological notes on *Eulota sieboldiana* Pfeiffer, a snail injurious to some vegetables [trans. title], Y. OKADA (*Jour. Imp. Agr. Expt. Sta. Nishigahara, Tokyo, Japan*, 2 (1932), No. 1, pp. 109-112, pl. 1; *Eng. abs.*, p. 112).—Notes are given on a snail that is highly destructive in the Prefectures of Fukuoka and Chiba, Japan, to vegetables, including the cucumber, radish, cabbage, etc.

A chironomid parasite of a mollusk [trans. title], P. MATHIAS and L. BOULLE (*Compt. Rend. Acad. Sci. [Paris]*, 196 (1933), No. 23, pp. 1744-1746).—The authors record the rearing of a chironomid from the snail *Limnaea limosa* L. from a reservoir in the Department of Hérault. In the month of March about 20 percent of the snails were observed to be parasitized by this midge. The first of May from 35 to 75 percent of the snails in one pool were found parasitized by it.

A review of Canadian helminthology, I, II, W. E. SWALES (*Canad. Jour. Res.*, 8 (1933), No. 5, pp. 468-482).—The first contribution (pp. 468-477) deals with the present status of knowledge of the helminth parasites of domesticated and semidomesticated mammals and economically important birds in Canada, as determined from works published prior to 1933. The second contribution (pp. 478-481) consists of additions to part 1, as determined from a study of parasitic helminths collected in Canada. A check list of helminth parasites of economically important mammals and birds in Canada is included in part 1, as is a bibliography of 37 titles in part 2.

The chemical relationship between certain insecticidal species of fabaceous plants, R. C. ROARK (*Jour. Econ. Ent.*, 26 (1933), No. 3, pp. 587-594).—The author reports that certain insecticidal species of plants representing six genera of the family Fabaceae contain constituents that are closely related chemically. "Rotenone is found in *Cracca*, *Derris*, *Lonchocarpus*, *Millettia*, *Mundulea*, and *Ormocarpum*. Deguelin, an isomer of rotenone, and tephrosin, a hydroxydeguelin, are found in *Cracca*, *Derris*, and *Lonchocarpus*. Toxicarol is found in *Cracca* and *Derris*. Other constituents of minor insecticidal value are also found in these plants."

A visit to pyrethrum fields of Dalmatia, A. HARTZELL (*Jour. Econ. Ent.*, 26 (1933), No. 3, pp. 583-586, pls. 2, fig. 1).—An account is given of a trip made in August 1932 to Dalmatia, where the pyrethrum industry was studied. Proposed measures to improve the quality of the product are reviewed.

Insecticides from nicotine derivatives, L. N. BILGER, M. WESTGATE, and R. LOVELAND (*Hawaii Sta. Rpt. 1932*, pp. 12, 13).—This is a brief statement of the progress made in preparing an insecticide from nicotine which kills by stomach poisoning rather than by fumigation.

A new development in the fixation of nicotine, W. MOORE (*Jour. Econ. Ent.*, 26 (1933), No. 3, pp. 723-726).—This contribution from the New Jersey Experiment Stations reports upon a new insoluble nicotine insecticide which is prepared by heating an aqueous solution of nicotine, resorcinol, and formaldehyde. "A finely divided precipitate is obtained. The washed, air-dried product contains about 22 percent nicotine. The nicotine dissolves in water to the extent of 0.004 g in 100 cc. It is about one fifth as soluble as the nicotine in nicotine tannate. Prepared as a paste, the new material was mixed with oil and applied to apples by dipping. Its toxicity to codling moth (*C[arpocapsa] pomonella* L.) was equal to that of nicotine tannate. The oil caused it to stick to the apple, so that the deposit was about twice as resistant to washing with water as was a deposit of nicotine tannate."

The effect of various commercial calcium arsenates on bean foliage, N. F. HOWARD and F. W. FLETCHER (*U.S. Dept. Agr., Bur. Ent.*, [1933], pp. 31, fig. 1).—In tests made of 19 commercial brands of calcium arsenate wide differences were found among them as to their safeness for use on bean foliage, 5 being rated as safe, 5 as intermediate, and 9 as unsafe.

"Previous experience has indicated, and the conclusions are substantiated in this investigation, that hydrated lime is the most practical corrective for

use with commercial calcium arsenate on bean foliage. A combination of sulfur and hydrated lime is an efficient corrective in the proportions of 1:1:4 by weight (calcium arsenate, sulfur, and hydrated lime, respectively). Bordeaux mixture is an excellent corrective and is more effective than lime, but may of itself cause plant injury under certain conditions when used by itself. Copper-lime dusts are good correctives but may cause foliage injury when used by themselves, as in the case of Bordeaux mixture.

"The rate of evaporation in the air as measured by atmometer spheres appears to be an important index of atmospheric conditions which influence the degree of foliage injury caused by the application of calcium arsenate to bean foliage. Quick drying of the spray tends to mitigate foliage injury. It is difficult if not impossible, in many instances, to correlate the effects of humidity and temperature with the degree of foliage injury. Water-soluble arsenic, as present in most of the brands tested, is not an important index of foliage injury. No methods of determining, by chemical analysis, why some brands burn and others do not could be devised, although careful investigations were carried on cooperatively by chemists.

"The uniformity of the gross chemical composition and toxicity to the larvae and adults of the Mexican bean beetle tends to show that commercial calcium arsenates are well standardized products from certain standpoints. On the other hand, the variability of the effects of different brands as regards toxicity to bean foliage is very great."

Arsenical residues found on apples in the Pacific Northwest throughout a season of typical spraying with lead arsenate, R. H. CARTER and E. J. NEWCOMER (*Jour. Econ. Ent.*, 26 (1933), No. 3, pp. 572-580, figs. 5).—Apples from trees which had been sprayed throughout the season with lead arsenate were analyzed for arsenical residue before and after each spray and at harvest time. "A fairly uniform minimum coating of about 0.006 mg/cm² was found to have been maintained during the season by spraying about every 10 days when growth was rapid, and every 2 or 3 weeks later on. This coating was increased to about 0.012 mg/cm² by each of the various applications, resulting in an average coating of about 0.10 mg/cm². The relationship between the residue results calculated as grains per pound and as milligrams per square centimeter is discussed. The percentages of the total accumulated residue at harvest time put on by each spray is indicated."

The removal of lead and arsenic spray residues from apples, A. L. WEBER and H. C. McLEAN (*Jour. Econ. Ent.*, 26 (1933), No. 3, pp. 727-730).—As the result of numerous fruit-washing experiments at the New Jersey Experiment Stations, methods have been devised to remove lead and arsenical residues from apples satisfactorily and economically. The results obtained in washing experiments led to the conclusion that the new lead tolerance can be met under the following conditions: (1) With hydrochloric acid alone where no late oil sprays have been used or no heavy wax coat is present; (2) with Vatsol or Alkanol B in conjunction with hydrochloric acid where late oil sprays were used, but the fruit has not become waxy; and (3) with Vatsol and hydrochloric acid where the fruit is heavily coated with wax and may or may not contain oil sprays.

Compatibility of oil emulsion-cresylic acid sprays with fungicides, J. M. GINSBURG (*Jour. Econ. Ent.*, 26 (1933), No. 3, pp. 566-572).—Laboratory tests at the New Jersey Experiment Stations have shown that "stable spray mixtures can be prepared from oil emulsions containing cresylic acid with either freshly prepared Bordeaux or lime-sulfur containing organic colloids. Orchard experiments on five blocks of apple trees have shown that the addition of fungicides

does not in any way interfere with the toxicity of either oil emulsion to red mite eggs or of cresylic acid to aphid eggs."

Vapo Dust—a development in scientific pest control, W. B. PARKER (*Jour. Econ. Ent.*, 26 (1933), No. 3, pp. 718-720, pls. 2).—The author describes the so-called Vapo Dust and the Vapo Dust machine that have been developed, by means of which process phytonomic oils (oils that can be safely applied to plant foliage without causing injury), alone or containing concentrated insecticidal or fungicidal materials, are diluted with air to form a fog that envelops pest-infested plants or trees in such a way as to rapidly, economically, and completely cover them with a thin and uniform film of very active material.

A method of rapidly applying liquid soil insecticides, J. M. MERRITT, C. B. DIBBLE, and O. E. ROBEY (*Jour. Econ. Ent.*, 26 (1933), No. 3, pp. 580-582).—This is a contribution from the Michigan Experiment Station in which it is shown that economical application of large quantities of dilute soil insecticides can be made by means of a porous hose, the dilution of the active ingredient being effected by pumping into the water supply.

Directory of manufacturers of insecticides, their products and analyses, T. J. HEADLEE (*Jour. Econ. Ent.*, 26 (1933), No. 3, pp. 689-691).—In this contribution from the New Jersey Experiment Stations, the author considers the large number of new insecticides yearly offered for sale, many apparently untried, and the desirability of distinguishing between meritorious and untested products. The possibility of a license system is also considered.

Radio waves kill insect pests, J. H. DAVIS (*Sci. Amer.*, 148 (1933), No. 5, pp. 272, 273, figs. 6).—The author reports briefly upon work in a plant that has been in operation a year, in which many stored seeds, packaged and bulk milled cereals, etc., have been treated by radio waves. The results of the author's research work indicate definitely that weevils in all stages of their development, from eggs to adults, can be exterminated without injury to the germinating properties of grain, or appreciably affecting the moisture content, and without adversely affecting the food value. Thirty- and 6-m waves were used, the former of low capacity and the latter of high capacity. The 30-m low-capacity waves were effective in exterminating adult insects in small quantities of wheat within a period of about 90 seconds, but the eggs later hatched out. With the 20-kw., 6-m waves, an exposure of 6 seconds was sufficient to exterminate eggs, larvae, and adults.

[**Notes on economic insects and insecticides**] (*Jour. Econ. Ent.*, 26 (1933), No. 3, pp. 730-736).—The contributions presented (E.S.R., 69, p. 232) are as follows: Length of Adult Life of *Paratrioza cockerelli* (Sulc.), by G. F. Knowlton (p. 730); Lime-Sulfur Injury Accentuated by Casein Spreader, by R. H. Smith (pp. 730, 731); *Otiorhynchus ligustici* L., a European Snout Beetle New to This Country, by G. W. Herrick (pp. 731, 732); Control of the Birch Leaf-Mining Sawfly, by A. E. Brower (p. 732); The Effect of Low Temperature on the San Jose Scale in Georgia, by O. I. Snapp and J. R. Thomson (pp. 732, 733); Many Bark Beetles Destroyed by Predacious Mite [*Parasitus* spp.], by H. J. Rust (pp. 733, 734); *Ptinus tectus* Boieldieu, by E. O. Essig (pp. 734, 735); and A Laboratory Method for Determining Approximately the Evaporation of Petroleum Spray Oils under Field Conditions, by L. H. Dawsey (pp. 735, 736).

Insect pests, J. A. HYSLOP (*Jour. Econ. Ent.*, 26 (1933), No. 3, pp. 692-694).—A discussion of the insect conditions in 1932 and the influence of weather effects, especially of the preceding mild winter.

Entomology, N. L. VIOLETTE (*Maine Forest Commr. Bien. Rpt.*, 19 (1931-32), pp. 57-73).—An account is given of some 14 insect pests, serious outbreaks of which occurred during the biennium, with notes on several additional pests.

[Report of work in entomology in Maryland] (*Maryland Sta. Rpt. 1932*, pp. XVII, XVIII).—A brief statement is made of the progress and results of experiments with strawberry leaf roller parasites and a mite (*Phyllocoptes* sp.) injurious to privet.

[Report of work in Massachusetts with economic insects and their control] (*Massachusetts Sta. Bul. 293 (1933)*, pp. 28-34, 46).—The work of the year reported upon (E.S.R., 67, p. 424) includes that with the investigation of materials which promise value in insect control, the control of onion thrips, the spray residue problem, apple maggot control, introduction of parasites of oriental fruit moth, and a systematic study of oil sprays, all by A. I. Bourne; the plum curculio, naphthalene as a fumigant for the control of greenhouse insect pests, the biology and control of the carrot rust fly, and the influence of temperature on the development of red spider, all by W. D. Whitcomb; and the preparation of miscible oil sprays from five different lubricating oils, by E. B. Holland.

Insect and other animal pests of 1932, R. S. MACDOUGALL (*Highland and Agr. Soc. Scot. Trans.*, 5. ser., 45 (1933), pp. 46-80, figs. 11).—This is the annual contribution on insects of importance occurring in, or liable to be introduced into, Scotland (E.S.R., 68, p. 66).

[A report of entomological work in Mauritius], A. MOUTIA (*Mauritius Dept. Agr. Ann. Rpt. 1931*, pp. 9-12).—A brief report of the occurrence of and work of the year with economic insects (E.S.R., 67, p. 562), in which particular mention is made of the percentage of parasitism of *Phytalus smithi* (Arr.) by its parasites *Tiphia parallela* Smith and *Elis thoracica* Fab.

Entomology memoirs.—Memoir No. 8 (*Union So. Africa Dept. Agr., Ent. Mem. 8 (1932)*, pp. 45, figs. 79).—This memoir includes the following contributions: New Species of South African Psyllids, III, by F. W. Pettey (pp. 3-23) (E.S.R., 59, p. 456), and Records of South African Fruit-Flies (Trypetidae, Diptera), with Descriptions of New Species, by H. K. Munro (pp. 25-45).

Entomological investigations, G. A. JULIUS ET AL. (*Aust. Council Sci. and Indus. Res. Ann. Rpt.*, 6 (1931-32), pp. 20-23).—A brief summary of the occurrence of and work with economic insects in Australia (E.S.R., 65, p. 547).

Vegetable insect scouting in New Jersey, R. C. BURDETTE (*Jour. Econ. Ent.*, 26 (1933), No. 3, pp. 672-674).—This contribution from the New Jersey Experiment Stations reports upon systematic scouting of vegetable crops for the beginning of insect outbreaks, with the object of forestalling outbreaks and securing better control.

Insects collected on apple blossoms in western New York, E. F. PHILLIPS (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 9, pp. 851-862).—This contribution from the New York Cornell Experiment Station reports upon collections made in the spring of 1931 from apple trees in seven orchards in Monroe County lying in the center of the western New York fruit belt along the south shore of Lake Ontario.

The details of the collection of 3,555 individual insects, which represent the results of a total of 459 man hours of collecting, are presented in tabular form. The tables include (1) Diptera collected and frequency of each species, by orchards, (2) insects of the genus *Halictus* collected and frequency of each species, by orchards, (3) temperature and time data in regard to the collecting of the genus *Halictus*, (4) insects of the genus *Andrena* with similar data, (5) temperature and time data in regard to the collecting of the genus *Andrena*, and (6) other solitary bees, bumblebees, and miscellaneous Hymenoptera.

The author considers the sparsity of the population of wild insects in the seven orchards where collections were made to be striking but not surprising.

The observations have shown honeybees to outnumber all other insects. It is concluded that there is nothing that a fruit grower or group of fruit growers can do in a practical way to increase the population of wild insects, with the possible exception of certain syrphid flies, the larvae of which are at times present by the millions in slow-flowing small streams or ditches polluted by cannery or milk wastes, especially those with mud bottoms.

Injurious and beneficial insects affecting the cranberry (*Massachusetts Sta. Bul.* 293 (1933), pp. 21-23, 61).—The work of the year briefly reported upon (E.S.R., 67, p. 428) includes control of the cranberry root grub *Amphicoma vulpina*, tests of pyrethrum dust, gipsy moth and contact sprays, nicotine sulfate and the cranberry fruit worm, and control of the cranberry spittle insect, all by H. J. Franklin; and June flooding for fireworm control, by H. F. Bergman, W. E. Truran, and J. L. Kelley, and June flooding for leafhopper control, by Bergman and Truran, both conducted by the U.S.D.A. Bureau of Plant Industry in cooperation with the station.

The insects and diseases of rhododendron and azalea, R. P. WHITE (*Jour. Econ. Ent.*, 26 (1933), No. 3, pp. 631-640, pls. 2).—The first part of this contribution from the New Jersey Experiment Stations (pp. 631-635) briefly considers the more important insect enemies of rhododendron and azalea.

Vapor-heat treatment for the control of bulb pests and its effect upon the growth of narcissus bulbs, F. J. SPRUIJT and F. S. BLANTON (*Jour. Econ. Ent.*, 26 (1933), No. 3, pp. 613-620).—The authors find that vapor heat may be employed for the control of the bulb flies, even the lowest temperature (110° F.) with a short-time duration (three hours) having been found ample for the control of both the larvae and pupae of *Eumerus*. "There are indications that the narcissus bulb nematode *Tylenchus dipsaci* Kühn may be killed by this method without injury to the plants. The stimulating effect upon the growth, due to a moderate treatment, is expressed in the considerable weight increase of field-grown stock, and in most cases the bulbs treated at the higher temperatures were as good as or better than the untreated checks. Bulbs that were forced in a greenhouse after being submitted to a vapor treatment at 120° for two hours produced flowers equal to those of untreated checks. At lower temperatures the flowering date would sometimes be slightly advanced, but not enough to be of commercial importance. The foliage was not injured by this method of treatment."

Forest insects of the Swiss National Park, A. BARBEY (*Les Insectes Forestiers du Parc National Suisse. Aarau: H. R. Sauerlaender & Co., 1932, pp. 50, pls. 24, fig. 1*).—This contribution reports upon the morphology and biology of some 61 important forest insects of the Swiss National Park, based upon visitations made at short intervals during the summers of 1918 to 1928, respectively.

Dry-wood-inhabiting termites as a possible factor in the etiology of sprue, F. P. JEPSON (*Ceylon Jour. Sci., Sect. D, Med. Sci.*, 3 (1933), No. 1, pp. 3-46, pls. 16).—The observations reported have led the author to suggest that the ingestion of the fecal pellets of dry-wood-inhabiting termites in food might be responsible, directly or indirectly, for the causation of sprue. The account is presented in connection with a five-page list of references to the literature.

The phases of the Rocky Mountain locust *Melanoplus mexicanus* (Saunders), J. C. FAURE (*Jour. Econ. Ent.*, 26 (1933), No. 3, pp. 706-718, pl. 1).—In continuation of the author's earlier work, in which he was able to transform the progeny of the solitaria phase of *Locustana pardalina* (Walk.) of South Africa into the gregaria phase (E.S.R., 68, p. 639), he reports observations on *M.*

mexicanus in rearing experiments conducted at St. Paul, Minn., during May, June, and July 1932, as pointed out by G. W. Herrick in a foreword to the article.

The observations and experiments reported are thought to warrant the conclusion that the form considered by the United States Entomological Commission as reported in 1878¹ as a distinct species, and long known as *M. (Caloptenus) spretus*, was the gregaria phase of *M. mexicanus*, the name *M. spretus* (Walsh) 1866, therefore being a synonym for *M. mexicanus* (Sauss.) 1861.

The desert locust, *Schistocerca gregaria* Forsk, in Egypt, E. BALLARD, A. M. MISTIKAWI, and M. S. EL ZOHEIRY (*Egypt Min. Agr., Tech. and Sci. Serv. Bul.* 110 (1932), pp. XI+149, pls. [79]).—Following an account of locust invasion in Egypt, 1927–30, in part 1 (pp. 1–33), the life history and control of the insect in Egypt is dealt with at length in part 2 (pp. 34–102). A bibliography of 59 titles is included, and statistical data are presented in appendixes.

The present status of the gladiolus thrips in the United States, C. A. WEIGEL and F. F. SMITH (*Jour. Econ. Ent.*, 26 (1933), No. 3, pp. 523–528).—The present distribution, economic importance, and seasonal history of *Taeniothrips gladioli* M. & S., including overwintering, are here discussed. Observations on the effectiveness of control measures employed by commercial growers are reported.

Life-history studies of the gladiolus thrips (*Taeniothrips gladioli* M. & S.), F. F. SMITH and R. H. NELSON (*Jour. Econ. Ent.*, 26 (1933), No. 3, pp. 528–536, pl. 1).—A description is given of the cages used for life history studies of *T. gladioli* on corms and growing plants, together with data on its habits, parthenogenesis, oviposition, and development at controlled temperatures on stored corms and on plants in the insectary.

Preliminary report on the control of the gladiolus thrips on corms in storage, F. F. SMITH and H. H. RICHARDSON (*Jour. Econ. Ent.*, 26 (1933), No. 3, pp. 536–545).—Tests made of various corm treatments, including heat, fumigants, insecticidal and fungicidal dips, dusts, and smudges, with reference to the mortality of *Taeniothrips gladioli* M. & S. and the effect on the corms and succeeding growth are reported. In preliminary experiments, 8 of the 19 materials or treatments tested in the laboratory for the control of thrips on unscaled gladiolus corms in storage showed a high degree of efficiency by killing the thrips and not seriously injuring the corms.

Field control of the gladiolus thrips (*Taeniothrips gladioli* M. & S.), H. H. RICHARDSON and R. H. NELSON (*Jour. Econ. Ent.*, 26 (1933), No. 3, pp. 546–554).—In tests made during the season of 1932 with paris green-brown sugar spray, a lead arsenate combination spray, and nicotine tannate, each being tested on 15 small plats, the paris green-brown sugar spray was by far the most effective not only in controlling the thrips but also in reducing thrips injury to the flowers. It was found that *T. gladioli* does not move about much during the growing and early blooming season, but that considerable numbers do migrate, apparently close to the ground, after the flowers are cut. Muslin barriers 3 ft. high erected between treated plats were apparently effective up through flowering time in reducing any slight movement of thrips from one plat to another. Observations of the predator *Orius insidiosus* (Say) indicated that it can kill as many as 30 thrips per day, and that it might reduce thrips populations in small isolated plats.

Greenhouse and field tests for the control of the gladiolus thrips (*Taeniothrips gladioli* M. & S.), C. C. HAMILTON (*Jour. Econ. Ent.*, 26 (1933), No. 3, pp. 555–565).—Contributing from the New Jersey Experiment Stations,

¹ U.S. Geol. Survey, U.S. Ent. Comn. Ann. Rpt., 1 (1877), pp. XVI+477+295, pls. 8, figs. 111. (Published 1878.)

the author reports that *T. gladioli* probably does not pass the winter in the fields in large numbers in that State but that the destruction of waste corms, volunteer plants, and other rubbish in and surrounding the field is advisable.

"The destruction of the thrips on corms in storage may be accomplished by a number of methods, such as dipping in mercury compounds, nicotine solutions, fumigating with naphthalene, nicotine dust, pyrethrum dust, calcium cyanide, and other materials. In controlling the thrips on the foliage it is necessary to start early and spray frequently. Dusts containing pyrethrins or rotenone, applied either as dusts or as wet sprays, were more effective than liquid sprays containing either pyrethrins or rotenone. The brown sugar, paris green, and water spray is said to be very effective and considerably cheaper than many other sprays."

Economic status of the green stinkbug with reference to the succession of its wild hosts, W. J. SCHOENE and G. W. UNDERHILL (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 9, pp. 863-866, fig. 1).—This contribution from the Virginia Experiment Station, reporting upon studies made in a farming section about 8 miles north of Richmond, is presented under the headings of host preferences, importance of a succession of hosts, attack on economic crops, transmission of yeast-spot disease, and natural enemies.

This plant bug is single brooded, feeds and deposits eggs by preference on wild hosts, and requires green pods or fruit for food. Its active breeding and development period is about 3 months, which is generally too extended for one host to furnish a continuous supply of food. The Virginia studies, extending over seven seasons, indicate that a host succession is necessary for the insects to become numerous. Furthermore, it appears that cultivated crops are not severely attacked except when the host succession is incomplete or broken. When the insect feeds on lima beans the pods generally become inoculated with *Nematospora phaseoli*, the cause of a fungus disease which occurs widespread in eastern Virginia and may result in a complete crop failure, especially in humid seasons.

Very few natural enemies have been taken in Virginia, with the exception of egg parasites, six species of which were reared, namely, *Trissolcus euschisti* (Ashm.), *Anastatus reduvii* (How.), *A. pearsalli* (Ashm.), *A. mirabilis* (Walsh), *Telenomus dimmocki* (Ashm.), and *T. podisi* (Ashm.). The average parasitism of eggs for six seasons at Richmond ranged from 16 to 27 percent, with as high as 55 percent in some localities. Of these parasites, *T. euschisti* generally ranked first and *A. reduvii* second in importance. *A. pearsalli* was third in numbers, but was never very numerous, and the remaining three species were scarce. Nymphs and adults were parasitized by tachinids, the parasitism being very light except in one or two collections when eggs were very numerous on nymphs and adults. In one of these 65 percent of the adults were found to be parasitized.

The green peach aphid.—Progress report of spraying experiments, K. M. WARD (*Jour. Dept. Agr. Victoria*, 31 (1933), No. 6, pp. 278-281, figs. 4).—The author considers the remarkable egg-killing efficiency of the tar-distillate wash and the consequent high degree of control that it exercises over the green peach aphid to be the most outstanding feature of the tests conducted.

Food plants of *Dialeurodes citri* Ashmead (Aleyrodidae): Is *Jasminum* one of them? M. A. HUSAIN and A. W. KHAN (*Indian Jour. Agr. Sci.*, 2 (1932), No. 3, pp. 242-253, pl. 1).—A complete list is given of 46 plants so far reported as food of the citrus white fly. It is pointed out, however, that this list requires careful revision. "From field observations, cross-inoculation experiments, and examination of the material available it has been established that,

in the Punjab, *D. citri* does not feed on any plant other than *Citrus* spp. and cannot be bred under experimental conditions on *J. sambac*, *Melia azedarach*, *Punica granatum*, *Psidium guajava*, *Ficus religiosa*, *Pyrus communis*, *Aegle marmelos*, and *Murraya exotica*. It has been established that the species attacking *Jasminum* and *Hiptage* is *D. kirkaldyi*, which cannot be bred on *Citrus*. The two species, although resembling in their general shape, are distinct in their food preferences. A comparative statement of the distinguishing characters of *D. citri* and *D. kirkaldyi* is given."

Biology and control of *Chrysomphalus dictyospermi* (Morg.), A. W. CRESSMAN (*Jour. Econ. Ent.*, 26 (1933), No. 3, pp. 696-706, fig. 1).—A discussion is given of the biology and control of *C. dictyospermi*, which attacks certain greenhouse and ornamental plants and tropical and subtropical fruit and shade trees. Data are given on reproduction, development, mortality, natural enemies, and host susceptibility. Oil sprays have proved to be an efficient means of control.

Progress in red scale control, H. J. QUAYLE (*Calif. Citrogr.*, 18 (1933), No. 8, pp. 216, 225-227).—This is a popular review of the progress of control work with the red scale of citrus, a contribution from the California Citrus Experiment Station, which was presented as an address on May 3, 1933.

An account of my studies in the biology of *Pieris rapae* Linné, II, O. QUERCI (*Ent. Rec. and Jour. Variation*, 45 (1933), No. 5, pp. 65-70).—This is a report of studies of the imported cabbage worm conducted in continuation of those previously noted (E.S.R., 69, p. 239).

The present status of the gipsy moth, A. F. BURGESS (*Jour. Econ. Ent.*, 26 (1933), No. 3, pp. 598-603).—A review of the status of the gipsy moth in the United States.

Bionomics and external structures of *Liparis dispar*, an insect noxious to *Livistona chinensis* R. Br. [trans. title], S. NAKAZIMA and K. FURUKAWA (*Bul. Miyazaki Col. Agr. and Forestry* No. 5 (1933), pp. 1-12, pls. 3; *Eng. abs.*, p. 12).—This report of studies of the gipsy moth in Japan includes an account of its life history as observed on the Island of Aosima, at the southern part of Miyazaki Prefecture and about 200 m away from the mainland.

A pest of cured tobacco, *Ephestia elutella* Hübner, W. D. REED, E. LIVINGSTONE, and A. W. MORRILL, JR. (*U.S. Dept. Agr. Circ.* 269 (1933), pp. 16, figs. 7).—This is a report of studies of a moth enemy of tobacco, and of other dried vegetable products, which has appeared in the bright-tobacco belt of the United States as a pest of flue-cured tobacco. An earlier account of its occurrence in cured tobacco in the United States by Back and Reed has been noted (E.S.R., 64, p. 547). The studies of its life history reported upon were conducted in the laboratory at Richmond, Va., in the summer and fall of 1931.

"The duration of the egg-to-adult period of individuals that hatched in June and July ranged from 45 to 95 days, whereas those that hatched in August required 56 to 81 days to complete the cycle. This uneven rate of development makes it difficult to judge the effects of temperature on the insect. Data on 30 mated pairs are presented, including daily records of egg laying. The average longevity of the females was 8.7 days, the mean average temperatures ranging from 73.3° to 84.5° F. The average lengths of the different periods were as follows: Preoviposition period, 0.7 day; oviposition period, 6.3 days; postoviposition period, 1.7 days.

"The total number of eggs laid by one female ranged from 37 to 279, the average being 127.3. Records of incubation of 3,820 eggs are given, showing the following variations: Average maximum, 7.1 days; average minimum, 4.5 days. The total number of eggs laid by one female during 24 hours ranged

from 0 to 90. Most of the egg laying took place during the first 5 days of each female's life.

"Larvae usually feed from the stem end of the tobacco leaf toward the tip. They have been found feeding as deep as 8 in. from the staves in hogsheads of tobacco and have demonstrated their capacity to inflict serious damage on leaf tobacco.

"From the data presented it is probable that four generations develop from June 1 to October 31 in unheated warehouses in the bright-tobacco belt. Moths reared in the laboratory showed a ratio of 46.7 percent males to 53.3 percent females, and those collected from infected warehouses a ratio of 60 percent males to 40 percent females.

"*Microbracon hebetor* (Say) was collected while it was parasitizing the larvae of *E. elutella*, and a small mite, *Seius* sp., was found attacking adults. The work of larvae of *E. elutella* is contrasted with that of the cigarette beetle larvae, as an aid to tobacco dealers and manufacturers in identifying infestations. Stored tobacco infested by *E. elutella* should be fumigated promptly. The tobacco trade may assist in preventing the further spread of this insect by arranging for fumigations. These, to be effective, should be conducted by experienced persons."

Codling moth control, S. W. HARMAN (*New York State Sta. Bul.* 627 (1933), pp. 31, figs. 3).—This is an account of control work conducted during the season of 1932 in the vicinity of Youngstown, Niagara County, where infestation was very severe.

"Observations on the habits of the insect indicated that egg laying was continuous from early in June to September, except for occasional short periods during inclement weather. There was a decrease in egg deposition for a short period in late July and early August which marked the end of the first brood and beginning of the second brood. However, due to the overlapping of the generations, there was no interval between June and September when moths and eggs were not present.

"Recommendations adapted to the needs of individual growers must obviously take into consideration the relative importance of the pest from year to year and in different localities and different orchards. Some sections require a less extensive spray program than others, but whether the program is relatively simple or otherwise the same general principles of control apply. Foremost in importance is the proper timing of applications with reference to insect activity to insure the satisfactory coating of fruits with spray materials during the period when apples are subject to maximum entry of caterpillars. Some consideration should also be given to supplementary practices, such as (1) pruning to open up the trees and allow thorough treatment of all parts, (2) thinning to remove wormy fruit and to break clusters in which the caterpillars readily gain entrance, and (3) banding to reduce both the size of the second brood and the winter carry-over caterpillars.

"The merits of each of these practices should be considered in relation to the conditions that exist in individual plantings. An efficient spray program insures the production of a large percentage of the apple crop free from injury and reduces gradually the winter carry-over of the pest.

"In the orchards under experiment, fruit that was effectively protected against the codling moth invariably retained spray residue in excess of the legal requirement."

Larval parasites of the codling moth in the Santa Clara Valley, California, G. S. HENSILL (*Jour. Econ. Ent.*, 26 (1933), No. 3, p. 603).—In the rearing of several thousand mature codling moth larvae collected from beneath

bands in Santa Clara County, Calif., during the last three years two species of parasites were met with, namely, the tachinid *Lixophaga variabilis* (Coq.) (Hypostena) and the braconid *Ascogaster carpocapsae* (Vier.). The percentage of parasitism by *L. variabilis* was found to run as high as 5 percent in some collections of larvae, while that by *A. carpocapsae* was very low, only a few specimens having been obtained.

Experience in enforcing compulsory clean-up regulations on account of the European corn borer, W. E. BRITTON (*Jour. Econ. Ent.*, 26 (1933), No. 3, pp. 604-606).—A brief report of the results of three seasons' experience in enforcement of a compulsory clean-up law in Connecticut to control the two-generation European corn borer. Methods of procedure, difficulties, and results are described.

Fish meal as a food for clothes moths, G. H. GRISWOLD (*Jour. Econ. Ent.*, 26 (1933), No. 3, pp. 720-722).—The author's experiments have demonstrated that fish meal is a food highly satisfactory to larvae of the webbing clothes moth, the insects reared on it having completed their life cycles in a surprisingly short time.

A revision of rice borers and their distribution [trans. title], S. KINOSHITA and A. KAWADA (*Jour. Imp. Agr. Expt. Sta., Nishigahara, Tokyo, Japan*, 2 (1932), No. 1, pp. 97-104, pl. 1, fig. 1; *Eng. abs.*, pp. 102-104).—The authors consider *Chilo oryzae* to be identical with the Asiatic rice borer (*C. simplex*), and that *C. zonellus*, which is limited in distribution to India, is a quite different species.

The parasites of the sugarcane borer in Argentina and Peru, and their introduction into the United States, H. A. JAYNES (*U.S. Dept. Agr., Tech. Bul.* 363 (1933), pp. 27, figs. 10).—In studies of the parasites of the sugarcane borer in Argentina from 1928 to 1930 and in Peru from 1929, 11 species, including 2 Diptera, 6 Hymenoptera, 1 nematode, and 2 fungi, were discovered. This bulletin deals with the biology and collection of the parasites and their shipment from South America.

In both countries the dextiid fly *Paratheresia claripalpis* v. d. Wp. was the most common parasite. It has several generations a year in both countries, parasitism in the young cane having ranged from 2 to 74 percent, with an average of about 32 percent. The percentage of parasitism in older cane was found to be considerably lower. The climatic conditions under which this species lives in Argentina are similar to those in Louisiana. A total of 637,063 puparia were introduced from Argentina and Peru into Louisiana during three seasons. Ten secondary parasites of this dextiid have been encountered.

The other parasites of the sugarcane borer observed include the tachinid *Leskiomima jaynesi* Ald., found only in Tucumán, Argentina, and in very small numbers; *Ipobracon tucumanus* Bréthes in Argentina and *I. rimac* Wolc. in Peru, both introduced into the United States, 59,632 adult females of the latter having been shipped during the three seasons; *Bassus stigmaterus* (Cress.), found in small numbers in both Argentina and Peru and only during the warmest months; *Telenomus (Prophanurus) alecto* Cwfd., found in fairly large numbers but only in the Province of Salta, Argentina; *Trichogramma minutum* Riley, occurring in both Argentina and Peru, where it is quite effective although parasitism by it remains low until the latter part of the season; *Apanteles xanthopus* (Ashm.), reared from cocoons found in small borer tunnels; the nematode *Hexameris microamphidis* Steiner; and the fungi *Botrytis delacroixii* and *Mucor botryoides*.

The Hessian fly in the Pacific Northwest, L. P. ROCKWOOD and M. M. REEHER (*U.S. Dept. Agr., Tech. Bul.* 361 (1933), pp. 24, figs. 2).—The Hessian fly is

known in the Pacific Northwest as an important wheat pest only in the humid area west of the Cascade Mountains and north of the Umpqua River, in which territory in 1927 approximately 4,220,000 bu. of wheat were raised on 189,000 acres. The studies reported indicate that it causes some loss in grain every year, and some years the damage, especially to wheat seeded in the winter and early spring, has been quite serious. The greatest injury occurs in years that are favorable to a large and early second spring emergence of flies. It appears normally to have at least three partial generations a year in the Pacific Northwest. The first spring emergence occurs in March, April, and early May; the second spring emergence in late May, June, or early July; and the fall emergence in late August, September, and early October. It is thought that the dry conditions east of the Cascade Mountains will prevent the establishment of the Hessian fly as a wheat pest in the great dry-land wheat belt of eastern Oregon and Washington.

"In the Pacific Northwest Hessian flies pass the winter as larvae in puparia on wheat stubble ('holdovers' which failed to issue in the fall emergence); on volunteer wheat (the offspring of flies of the fall emergence); or on wheat seeded in September, a practice of rare occurrence. The principal sources of flies for the spring emergences, the ones that lead to damage of planted grain, are the stubble and volunteer wheat in fields of young clover.

"Thirteen species of hymenopterous parasites have been reared from the Hessian fly in this area. Of these the most important are probably the species of *Platygaster*. One of these, *P. hiemalis* Forbes, appears normally to have two broods in this area. The seasonal history and status of these parasites are being further investigated. Hessian fly damage to the wheat crop of western Oregon and Washington would be practically eliminated if all wheat stubble were plowed under and deeply buried in the fall. . . . Wheat seeded about the middle of October is usually least injured by the Hessian fly. September seedings become infested by the fall brood of Hessian flies, and wheat seeded in the winter and early spring is usually the most severely injured by the spring broods."

A new enemy of the pineapple mealybug and a list of gall midge enemies of mealybugs, E. P. FELT (*Jour. N.Y. Ent. Soc.*, 41 (1933), No. 1-2, pp. 87-89).—Under the name *Lobodiplosis pseudococci* the author describes a new gall midge which is predacious on the pineapple mealybug in Hawaii:

The potato scab-gnat, *Pnyxia scabiei* (Hopkins), H. L. GUI (*Ohio Sta. Bul.* 524 (1933), pp. 21, figs. 6).—This is a report of studies of *P. scabiei*, a brief account of which by the author has been noted (*E.S.R.*, 69, p. 558). This dipteran is generally distributed in Ohio and has been found in several other States from Missouri to New York and West Virginia to Michigan. It has been definitely recognized as a potato pest since 1895. Two serious outbreaks have occurred in Ohio, the first in 1910 and the second in 1926. Following an account of its life history, methods of overwintering, habits, natural enemies, food material, nature and extent of damage, and methods of dispersion, control investigations are considered more at length.

P. scabiei may overwinter in the field or on stored potatoes. In storage it tolerates any temperature suitable for potatoes but is most active if both temperature and humidity are relatively high. Insofar as it has been observed, the potato scab gnat is almost free from natural enemies. One species of centipede has been found to consume large numbers of the larvae. The insect feeds upon a variety of materials, but the potato is the only crop which the author has observed to be injured by it. Injury to this crop may be to the seed piece, to the tender growing stems of the plants, or to the

tuber crop. When the seed piece is attacked, the stand may be reduced or the vitality of the plant which grows from the injured seed piece may be impaired. The damage done to the tuber crop is usually confined to a low percentage of the total yield but is important in that it occurs in some degree year after year. Occasionally, a high percentage of the crop may be damaged. The extent of injury occurring to a potato may be slight and confined to a small area, or it may be so severe that the entire surface may be affected. Wounds of large area and as much as 1 in. in depth have been found. Potatoes grown in soils in which the organic content is high or when straw mulch is used in the cultural practice are less susceptible to damage than when smaller amounts of organic matter are present. Migration through loose soil from the surface downward or from one hill of potatoes to another can be accomplished.

Summarizing the results of control work it is pointed out that "preferably potatoes free from scab gnat injury should be used for seed, but if such are not available the seed should be treated with corrosive sublimate or hot formalin according to the standard recommendations for controlling common potato scab. Potatoes should not be grown for two or more years in succession in areas where scab gnat injury has occurred. Cultural practices and cropping systems which return the maximum amount of organic matter to the soil afford a considerable degree of protection. The soil should be maintained at a reaction of pH 5 or slightly above. This may be done by avoiding heavy liming programs, or, if the reaction is high, it may be reduced by applying sulfur or other chemicals. The latter procedure, however, is attended with some risk and should not be attempted without careful study. Fortunately, the most useful measures applicable to scab gnat control follow the commonly recognized better practices for potato culture."

Growth stimulation of blow-fly larvae fed on fatigued frog muscle, H. M. Fox and G. P. SMITH (*Jour. Expt. Biol.*, 10 (1933), No. 2, pp. 196-200, fig. 1).—In the experiments here reported it was found that larvae of *Calliphora erythrocephala* Meig. fed on fatigued frog muscle attained a body weight 9 percent greater than those fed on resting muscle, and the rate of their heart beat was increased by 14 percent. The length of larval life and the oxygen consumption was the same in the two sets of larvae.

Report on the bionomics of the tsetse fly (*Glossina pallidipes* Aust.), and a preliminary report on a new method of control presented to the Provincial Administration of Natal, R. H. T. P. HARRIS (*Pietermaritzburg: Govt.*, 1930, pp. 75, figs. 14).—This is a detailed report of studies of *G. pallidipes* in Zululand, representing conditions when grazing and water are normal and when they are abnormal.

Studies on the seed-corn maggot, II, C. HARUKAWA, R. TAKATO, and S. KUMASHIRO (*Ber. Ōhara Inst. Landw. Forsch.*, 5 (1932), No. 3, pp. 457-478, figs. 5).—This second contribution (E.S.R., 64, p. 462) takes up the seasonal occurrence of the adult insects, seasonal distribution of the larva and pupa, development and growth of the maggot in different seasons, and behavior of the maggot during the summer and winter. The details are given in tabular form.

Control of the sheep tick on hill pastures: A review of the possibilities, with some experimental data, J. MACLEOD (*Highland and Agr. Soc. Scot. Trans.*, 5. ser., 45 (1933), pp. 114-127).—The author concludes that the combination of the serial dipping and starvation methods removes certain disadvantages incidental to the use of either method alone, and appears to be the most practical means which offers a fair hope of comparative success in the control of the castor-bean tick on infested pastures. An account of the biology of this tick, by the author, has been noted (E.S.R., 68, p. 795).

Changes in the glucose content of the Japanese beetle (*Popillia japonica* Newman) during metamorphosis, D. LUDWIG (*Anat. Rec.*, 54 (1932), No. 3, Sup., p. 43).—This is a report of determinations made of the total glucose content of 150 Japanese beetles in different stages of metamorphosis by application of the Hagedorn Jensen method. It was found that "the glucose content of the feeding third instar larvae average 0.49 percent, of early prepupae 0.45 percent, and of late prepupae 0.50 percent. Readings on pupae which had molted within the previous 24 hours showed a much higher glucose content (0.71 percent). The percentage of glucose decreased to 0.62 in individuals 2 to 3 days after pupation (pupae were kept at 25° C.), and then steadily increased until a maximum of 0.84 was reached at the end of the pupal period."

A new genus of West Indian Coccinellidae (Coleoptera), E. A. CHAPIN (*Biol. Soc. Wash. Proc.*, 46 (1933), pp. 95-99, pl. 1).—The genus *Decadiomus* is erected, for which *Diomus bahamicus* Casey 1899 is designated as the type species. *Decadiomus pictus*, the larvae of which were found feeding on the cottony-cushion scale at Dorado, P.R.; *D. hubbardi*, from Montserrat, West Indies; *D. tricuspis*, feeding on *Metaleurodicus* sp. on papaya at Rio Piedras, P.R.; and *D. peltatus*, taken on guava in Santiago de las Vegas, Habana, Cuba, are described as new.

Description of the larva of *Decadiomus pictus* Chapin (Scymnini, Coccinellidae), A. G. BÖVING (*Biol. Soc. Wash. Proc.*, 46 (1933), pp. 101-104, pl. 1).—This is a description of the larval stage of the lady beetle above described, found feeding on the cottony-cushion scale in Puerto Rico.

Some notes on beetles and their damage to hides and leather, F. O'FLAHERTY and W. T. RODDY (*Jour. Amer. Leather Chem. Assoc.*, 28 (1933), No. 6, pp. 298-306, pls. 3, figs. 2).—This contribution deals with the hide beetle and the red-legged ham beetle, found to damage green salted hides after unhairing and fleshing.

Notes on *Paederus fuscipes* Curt., a beetle which causes vesicular dermatitis in man, P. V. ISAAC (*Agr. and Livestock in India*, 3 (1933), No. 1, pp. 33-36, pl. 1).—This is a report of studies of a beetle that is the source of a vesicular dermatitis in man, commonly known as "spider lick." The affection is of frequent occurrence in certain seasons in Bihar, Bengal, Assam, and Ceylon.

A co-operative investigation of the quantitative relation between summer-fallow methods and the wireworm in Saskatchewan.—A progress report, K. M. KING and R. GLEN (*Sci. Agr.*, 13 (1933), No. 10, pp. 646-652).—This is a progress report of the results of an experiment under way in 1930, 1931, and 1932, aimed at testing four different methods of summer-fallowing upon wireworm populations and upon the rates of wireworm damage to wheat crops. The investigational procedure is described.

The control of the raspberry beetle, F. R. PETHERBRIDGE and I. THOMAS (*Jour. Min. Agr. [Gt. Brit.]*, 39 (1933), No. 11, pp. 1017-1028, figs. 2).—The experiments reported have shown the application of a derris dust (containing 0.2 percent rotenone) to be the most satisfactory means known of reducing the damage done to loganberries by *Byturus tomentosus* F. The actual details as to the most economical methods and times of application remain to be worked out.

On *Howardula phyllotretae* n.sp., a nematode parasite of flea beetles (Chrysomelidae; Coleoptera), with some observations on its incidence, J. N. OLDHAM (*Jour. Helminthol.*, 11 (1933), No. 3, pp. 119-136, figs. 3).—Under the name *H. phyllotretae* the author describes a new nematode parasitic in the body cavity of flea beetles of the genus *Phyllotreta* attacking cultivated crops and weeds in Hertfordshire, England, and Schleswig-Holstein, Germany.

The hairy-vetch bruchid, *Bruchus brachialis* Fahraeus, in the United States, J. C. BRIDWELL and L. J. BOTTIMER (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 8, pp. 739-751).—The authors first present a brief summary of knowledge of the habits of members of the genus *Bruchus*, pointing out the increased danger of their establishment in the United States as a result of changed commercial conditions. Then follow discussions of the food plants of *Bruchus* (restricted), commercial conditions affecting the distribution of Bruchidae, a history of *B. brachialis*, a synoptic table of the nearest allies of *B. brachialis*, *B. brachialis* in the National Museum, the life history of *B. brachialis* under conditions prevailing in New Jersey, quantity of food consumed and extent of infestation, parasites, present distribution in the United States, host plants of *B. brachialis*, economic relations of *B. brachialis*, and two other species of *Bruchus* from vetches, namely, *B. ulicis* and *B. maculatipes* Pic.

It is pointed out that *B. brachialis*, described from France in 1839, was collected at Haddon Heights, N.J., in June 1931, and by 1932 was known to occur in New Jersey, Delaware, Maryland, Virginia, North Carolina, and the District of Columbia. It attacks seeds of the cultivated forage plants hairy vetch, woolly-pod vetch, Hungarian vetch, and the wild *Vicia cracca*, and it is of economic significance because it destroys their seeds. As is typical of members of the genus, it deposits its eggs upon the green pods of the host plants, the larvae feeding within the seeds, where they transform. The adults emerge from the ripe seeds and cannot reinfest them. *B. brachialis* seems always to transform and leave the seeds in summer and hibernate elsewhere as an adult.

A description is given of the adult, and characters are pointed out to distinguish it from the closely allied European species of *Bruchus* and from all other American Bruchidae. Notes on the life history and habits of *B. brachialis* in New Jersey are recorded. In Haddon Heights about 80 percent of the seeds of volunteer plants of the hairy vetch produced during the egg-laying period of the bruchid were destroyed by it. *B. brachialis* was found to be attacked by six native American species of chalcidoid parasites, namely, *Eupelmus cyani-ceps amicus* Gir., *Eupelminus saltator* (Lindem.), *Microdontomerus anthonomi* (Cwfd.), *Zatropis incertus* (Ashm.), *Habrocytus* sp., and *Eurytoma tylodermatis* Ashm. The incidence of the different species of *Bruchus* upon seeds of the leguminous tribe Viciaeae, including numerous important economic plants, is summarized, the records being based mainly upon interceptions made in the course of the work of the Federal Department of Agriculture.

Parasites of the sunflower weevil, *Desmoris fulvus* Lec., during 1931 and 1932, J. H. BIGGER (*Jour. Econ. Ent.*, 26 (1933), No. 3, p. 652).—In this brief note mention is made of the rearing of *Microbracon mellitor* Say, *Eupelmus cyaniceps amicus* Gir., and *Trimeromicrus maculatus* Gahan on *D. fulvus* in Illinois.

Studies on the pH changes of body fluids during metamorphosis in an insect, *Sceliphron caementarium* (Hymenoptera), W. M. BOOKER (*Anat. Rec.*, 54 (1932), No. 3, Sup., p. 47).—The pH values of the body fluids of the larval, prepupal, and pupal stages of *S. caementarium* were determined by means of a microquinhydrone electrode. It was found that definite correlations exist between the pH of the body fluids and the stages of metamorphosis. The pH values of larval blood range from 6.60 to 6.80; for prepupal stages, 6.50 to 6.30; and for pupae, 6.43 to 6.35.

Hymenopterous parasites of Gyrinidae, with descriptions of new species of Hemiteles, F. G. BUTCHER (*Ann. Ent. Soc. Amer.*, 26 (1933), No. 1, pp. 76-85, figs. 8).—In addition to the hymenopterous parasite *H. hungerfordi* Cush., which was most abundant, a few individuals of three other species of the genus were

reared from pupae of beetles of the genus *Gyrinus* in Michigan, two of which are described as new under the names *H. cushmani* and *H. cheboyganensis*. Notes on the parasites, the life history of *H. hungerfordi*, and on *Cyrtogaster dineutes* Ashm. are included.

Eulophus viridulus Thoms., a parasite of *Pyrausta nubilalis* Hubn., H. L. PARKER and H. D. SMITH (*Ann. Ent. Soc. Amer.*, 26 (1933), No. 1, pp. 21-39, figs. 14).—A report is given of studies of the biology of a parasite of the European corn borer that occurs in corn, hemp, and *Artemisia* and is found in small quantities in central Europe, northern France, southern France, northern Italy, in the lower Po Valley and southern Italy around Napoli (Naples). It occurs rather abundantly in only one place, a limited region in the lowlands on the left bank of the Po River in the Province of Rovigo.

The parasite has at least three generations on the European corn borer in the lower Po Valley, the winter being passed in the pupal stage in the host tunnels. Efforts to breed this parasite on a large scale have thus far been unsuccessful. Field collections during the winter of 1930-31 yielded a total of 328,026 pupae for colonization in the United States.

The life history and habits of *Ixodes sculptus* Neumann (Ixodidae), H. HIXSON (*Iowa State Col. Jour. Sci.*, 7 (1932), No. 1, pp. 35-42, figs. 3).—This is a report of studies of the biology of the sculptured tick *I. sculptus*, based upon material taken from the 13-striped ground squirrel (*Citellus tridecemlineatus tridecemlineatus*) in the vicinity of Ames, Iowa.

The life-cycle of *Babesia bigemina* (Smith and Kilbourne) of Texas cattle-fever in the tick *Margaropus annulatus* (Say), with notes on the embryology of *Margaropus*, E. W. DENNIS (*Calif. Univ. Pubs. Zool.*, 36 (1932), No. 11, pp. 263-298, pls. 6, fig. 1).—In this contribution a review of the life history and anatomy of the cattle tick and an outline of its embryology are followed by an account of the life cycle of *B. bigemina* in the tick. The tick is considered to be ideally designed for its function as the biological vector of the organism of bovine piroplasmiasis. It is pointed out that the life cycle of *B. bigemina* has two distinct phases, (1) an asexual cycle in the vertebrate host where multiplication takes place in the red blood corpuscles by binary fission and (2) a simple sexual cycle in the tick.

A list is given of 40 references to the literature.

ANIMAL PRODUCTION

Livestock (*U.S. Dept. Agr. Yearbook 1933*, pp. 219-273, 303-317, figs. 22).—Articles of a general nature are presented under the following headings: Prices, Numbers, and Kinds of Animals Vastly Changed since the War, by C. L. Harlan, C. A. Burmeister, and G. B. Thorne (pp. 219-230); Animal Disease Control by Scientific Methods Shows Notable Progress, by J. R. Mohler (pp. 230-241); Experiments with Beef and Dual-purpose Cattle Aid in Efficient Production, by E. W. Sheets, W. H. Black, and J. A. Gamble (pp. 241-252); Trend in Hog Production Is toward Efficiency and Quality of Product, by S. S. Buckley and O. G. Hankins (pp. 252-263); Sheep Raising in U.S. Has Changed Greatly since Pioneer Period, by D. A. Spencer and C. G. Potts (pp. 264-273); Poultry Industry Fairly Resistant to the Depression, by S. A. Jones, G. W. Sprague, and A. Sturges (pp. 303-308); and Breeding and Management Have Greatly Increased Average Egg Production, by A. R. Lee and M. A. Jull (pp. 308-317).

[Experiments with livestock in Hawaii] (*Hawaii Sta. Rpt. 1932*, pp. 6, 21, 22).—Data are reported on the effect of feeding sprouted oats to dairy cattle and swine for correcting irregularities in breeding behavior, the effect of sugar-

cane molasses on production and reproduction of dairy cows, and the value of raw sugar for fattening hogs, by L. A. Henke.

With poultry, information is reported on sorehead (fowl pox) in baby chicks; sugarcane molasses for chicks; papayas, avocados, bananas, and sweet-potatoes for poultry; and raising turkeys in confinement, by C. M. Bice.

Fish meal as a food for live stock, H. E. WOODMAN ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul.* 63 (1933), pp. V+21).—The manufacture, composition, and characteristics of white fish meal are described in this bulletin. Its uses in the rations of the various kinds of livestock are discussed.

Commercial feeding stuffs—report on inspection, 1932, E. M. BAILEY (*Connecticut State Sta. Bul.* 351 (1933), pp. 509-642+XXV-XLVIII).—Guaranties and analyses are reported for 1,358 samples of feeding stuffs collected for official inspection during the calendar year 1932 (E.S.R., 67, p. 590).

The development and functional activities of the albino rat as affected by diets deficient in iron, T. B. KEITH and R. C. MILLER (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 10, pp. 943-961, figs. 3).—This study was undertaken at the Pennsylvania Institute of Animal Nutrition to determine the functions of iron in nutrition. Albino rats were fed either a diet low in iron, the protein and iron of which was supplied by dried skim milk powder, or an iron-rich diet containing meat and dried skim milk powder. The first ration contained 0.001 percent and the second 0.002 percent of iron.

There was no significant difference in the average rate of growth, the average of the respiratory quotients after 16 to 50 hours without food, or the average daily heat production of the rats fed the two rations. The average number of erythrocytes and of leucocytes per cubic millimeter of blood was practically the same for both rations during the first and second generations. The average number of grams of hemoglobin per 100 cc of blood was normal on both diets, but those on the high-iron diet had significantly more hemoglobin than those on the low-iron diet.

The low-iron diet was inadequate for successful reproduction, especially during the second generation. In the low-iron lot the females produced 6.9 young per litter in the first generation, while those on the high-iron diet produced 8.4 young. Of the young produced 65 and 84.5 percent, respectively, were weaned. The corresponding figures for the second generation were 6.9 and 8.3 young per litter and 34.8 and 79 percent weaned in the respective lots. The second generation of females on the low-iron diet also exhibited symptoms of sterility and cannibalism.

A histological examination showed no pathological conditions in the tissues of liver, kidney, spleen, bone, and muscle that could be attributed to the low-iron diet. When a ration adequate in all respects except for iron was fed, all of the functions of the body were apparently normal except the requirements for normal reproduction. The addition of beef muscle provided the iron necessary to supplement such a ration.

The associative effects of feeds in relation to the utilization of feed energy, E. B. FORBES, W. W. BRAMAN, M. KRISS, R. W. SWIFT, A. BLACK D. E. FREAR, O. J. KAHLENBERG, F. J. MCCLURE, and L. VORIS (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 8, pp. 753-770).—This study was undertaken at the Pennsylvania Institute of Animal Nutrition to determine whether the net energy values of feeding stuffs are constants when fed in combinations of feeds. The results were obtained by respiration calorimetry in a duplicate series of investigations with two 2-year-old steers fed during 28-day periods. Energy balance determinations were made with each of the steers during fast, at the energy-maintenance level with three rations of different character, and at a

production level, the ration being the same as above plus corn meal equivalent to half the estimated energy maintenance requirement. The heat production was measured by direct calorimetry, checked by indirect measurement.

When fed on a production level the apparent metabolizable energy of corn meal varied between 2,946 and 3,339 Calories and between 2,944 and 3,387 Calories for the two steers. The variations were due to the rations in which the corn meal was fed. The apparent net energy value of the meal when fed on a production level varied between 1,645 and 2,518 Calories per kilogram of dry matter, and was affected by the ration in which the corn was fed in the case of one of the steers. The average of the three lowest determinations of the digestible crude protein requirements of these steers was 21.7 g per 100 kg of live weight per day. The ratios of carbon to nitrogen in the urine were 1.2, 1.2, 1.3, and 1.3 to 1 on high-protein rations and 3.6, 3.2, 3.2, 3.7, 3.3, 3.8, 3.9, and 4 to 1 on low-protein rations. These results show that individual foodstuffs are susceptible of only superficial evaluation apart from the rations in which they are used.

The influence of foodstuffs on the acid-base balance of cattle urine, F. J. WARTH and N. K. AYYAR (*Biochem. Jour.*, 24 (1930), No. 6, pp. 1595-1600, fig. 1).—The Imperial Department of Agriculture in India, Bangalore, worked out and described a method for the determination of the acid-base balance of cattle urine. Using this method, a study was made of the urine of cattle while receiving different types of fodders.

It was found that when green fodders and cereal straws were fed the urine contained an excess of alkali and large amounts of carbon dioxide. The only exception observed was in the feeding of wheat straw, which caused acid urine. On overripe hay the urine contained little carbon dioxide and was neutral or acid in reaction. The progressive ripening of fodder tended to increase the acidity of the urine, but it was found that climatic conditions may materially modify this effect. The urines contained only traces of phosphoric acid, and the buffering was produced by organic acids of which hippuric acid forms approximately two thirds. When the organic acids were deficient carbon dioxide acted as a subsidiary buffer, and it regularly increased with excess of alkali. Some of the fodders used were deficient in chlorides.

Wheat as a cattle feed, E. A. TROWBRIDGE and H. C. MOFFETT (*Missouri Sta. Bul.* 325 (1933), pp. 18, figs. 5).—The results of two experiments with yearling steers showed that wheat could be used as a partial or complete substitute for corn or other cereals for fattening cattle. Coarsely ground wheat was worth approximately 10 percent more than whole wheat. Steers fed whole wheat made less gains per unit of feed, but the gains on hogs were greater than when ground wheat was fed. When not composing more than half the grain ration, ground wheat was worth from 5 to 15 percent more than corn. Steers fed ground wheat as the sole grain made gains on about 10 percent less feed than when corn was fed, but usually were lacking in finish. Ground wheat as the only grain lacked palatability, but this was not true when wheat made up only 50 percent of the ration. Wheat as the sole grain usually produced less rapid gains, but the gains were made on less grain than when corn was fed. Care had to be exercised in starting cattle on wheat in order to avoid digestive troubles.

A feeding experiment to compare the merits of single and mixed fodders, C. SINGH and D. RAJ (*Agr. and Livestock in India*, 2 (1932), No. 1, pp. 23-30, fig. 1).—A study was conducted by the Imperial Department of Agriculture, Bangalore, to determine whether mixed roughage was superior to single roughage. Heifers were divided into three groups and were fed ragi straw,

Bolarum hay, and a mixture of the two roughages, respectively. In addition a concentrate ration and green fodder were fed to all lots.

The hay group consumed more roughage than the straw group, while in the mixed roughage group the consumption was about the mean of the other lots. During a 100-day period the gains per head were 77, 86, and 80 lb. in the respective lots. From starch equivalent calculations the values assigned to ragi straw and hay were approximately correct, but absolutely the values were low. This latter condition was probably due to the fact that no allowance was made for chaffing. Since ragi straw swells much more than hay on wetting, the observed low consumption of straw was probably due to this property.

Effect of long-continued muscular exercise upon the chemical composition of the muscles and other tissues of beef cattle, H. H. MITCHELL and T. S. HAMILTON (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 10, pp. 917-941).—Continuing this study (E.S.R., 66, p. 256) at the Illinois Experiment Station, the results of two experiments showed that long-continued muscular activity had no effect on the water, iron, hemoglobin, or red cell content of the blood. In one test involving light work it was found that muscular work clearly and markedly reduced the iron content of the bone marrow, but otherwise no effect was noted on the iron and hemoglobin content of the tissues.

Only the liver showed a decided lowering in content of ether-soluble material, but the results of this analysis for the heart muscle were more nearly decisive than those for other muscle samples. In heavy work there was clear evidence of a lowered water content in liver, heart, and skeletal muscles, the effects on liver being the most pronounced. With light work, the water content of the liver was materially lowered, but the effect on the other muscles was less evident. There was no evidence that the conditions of the water in muscle tissue, whether bound or free, was affected by muscular work. The nitrogen content of the fat-free dry substance in the liver was distinctly lowered by heavy work, and such work exerted a general though less distinct depression on this constituent in other muscles. The effect of light work on this constituent was only evident in the liver. The reduction in the nitrogen content of the dry substance of the tissues produced by heavy work appeared to be the result of (1) a decrease in nitrogenous extractives, (2) an increase in glycogen, and (3) an increase in lipoids not extractable by ether.

In both experiments, prolonged muscular activity depressed the creatine content of the muscles. Samples of muscles analyzed immediately after slaughter showed this effect of work more clearly than did muscle samples taken from a chilled carcass. The collagen content of muscle was lowered by muscular activity, possibly due to an induced hypertrophy of muscular tissue with no corresponding increase in connective tissue elements. The ash content of the tissues was not significantly affected by the kind and degree of muscular activity.

Experimental studies in feeding fattening lambs, G. A. BROWN (*Michigan Sta. Spec. Bul.* 233 (1933), pp. 24, figs. 8).—The average of three feeding trials (E.S.R., 66, p. 163) showed that corn was superior to either barley or oats for fattening lambs. In these trials barley was worth 90 percent and oats 77 percent as much as No. 2 yellow corn when fed with corn silage and alfalfa hay. Adding corn silage to a ration of shelled corn and alfalfa hay resulted in a slight increase in the rate of gain and a slight reduction in cost of gain. Adding pea-sized linseed cake to a shelled corn, corn silage, and alfalfa ration brought about a marked increase in rate of gain, degree of finish, and a greater uniformity in the lambs, without increasing the cost of gains. The comparative value of corn and oats was not altered by adding linseed cake to rations containing these grains, although the addition of cake materially improved a

ration of oats, corn silage, and alfalfa. Feeding linseed cake with oats in the proportion of 1:14 was equally as satisfactory as a proportion of 1:7. Wheat in these tests was worth approximately 75 percent as much as corn.

Native medium wool lambs were as satisfactory as western lambs. On the other hand, native fine wool lambs gained less rapidly and had a higher feed cost per unit of gain than either native medium wool or western lambs.

Lamb feeding experiments with Atlas sorgo, R. F. Cox and W. E. CONNELL (*Kansas Sta. Bul.* 264 (1933), pp. 33, figs. 12).—In this study 10 lots of 24 to 27 white-faced range lambs, averaging 62 lb. initial weight, were fed for 110 days to determine the value of sorghum crops for lamb feeding.

When a ration of ground Atlas fodder, cottonseed meal, and ground Atlas grain was used, feeding the concentrates and roughage in the proportion of 50:50 produced larger and cheaper gains than a proportion of 40:60. The latter ratio, however, produced satisfactory gains, and the lambs were appraised the same as those fed the heavier grain ration. Lambs fed Atlas fodder and cottonseed meal in the proportion of 75:25 made slightly larger and cheaper gains during the first 35 days of the feeding period than the lambs fed grain, but for the entire feeding period they failed to fatten satisfactorily. Adding ground limestone to a ration of ground Atlas fodder, cottonseed meal, and ground Atlas grain increased the total gain 4 lb. per lamb. When ground wheat replaced the Atlas grain in the above ration the addition of ground limestone, while increasing the rate and decreasing the cost of gains somewhat, was not as valuable as when added to the Atlas grain ration. When a limited amount of alfalfa was added to the roughage portion of the ration, ground limestone produced no beneficial effects. Adding ground limestone to a ration of Atlas silage, cottonseed meal, and ground Atlas grain increased the total gain 3 lb. per lamb, reduced the cost of gain, and increased the palatability of the silage. Ground wheat produced somewhat larger and cheaper gains than ground Atlas when fed without ground limestone. When the mineral was added, the wheat produced larger but more expensive gains than the sorghum. Adding alfalfa to the basal ration increased the rate and economy of gains. The rate of gain was practically the same when the roughage portion of the ration consisted of ground Atlas fodder plus alfalfa hay or the fodder plus ground limestone, but the latter roughage was more economical. Ground Atlas fodder produced larger and more economical gains than the silage except when ground limestone was fed with the silage.

Pigs born without eye balls, F. HALE (*Jour. Heredity*, 24 (1933), No. 3, pp. 105, 106, fig. 1).—The birth at the Texas Experiment Station of a litter of 11 pigs, all without eyeballs, to a sow receiving a vitamin A-deficient ration is noted.

A contribution to the knowledge of the mechanical relations in wild horses [trans. title], A. OGRIZEK (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol.*, 24 (1932), No. 1, pp. 111-120, figs. 11).—Data are presented on the size of the angles formed by the bones of locomotion in the shoulder and hip of various species of so-called wild horses and hybrids, including the Przewalski horse, zebra, and ass.

[Poultry feeding, molting, and housing experiments in Arizona] (*Arizona Sta. Bul.* 143 (1933), pp. 79-120, figs. 12).—The results of studies reported in this bulletin are divided into two parts.

I. Poultry feeding experiments, H. Embleton (pp. 79-103).—Results are here reported of several feeding tests undertaken to obtain information regarding the comparative values and economics of certain feeds. When bran was used as the base for mash, each bird laid 15 more eggs per year and made a greater return over feed costs than when alfalfa meal was used. Meat scrap gave a greater net return over feed costs than either cottonseed meal or dried

buttermilk. Mortality was lowest in the cottonseed meal groups, and there was no appreciable difference in this factor in the meat scrap and dried buttermilk groups. It required 24 lb. 9 oz. of feed to raise a White Leghorn pullet to 26 weeks of age, at which time it averaged 3 lb. in weight. For Rhode Island Red pullets 21 lb. of feed were required to rear to 26 weeks of age and a weight of 3 lb. 6 oz. A ration with a wide nutritive ratio did not promote quick maximum growth in young chicks. The efficiency for growth promotion for the nutritive ratios used were 1:3.6, 100 percent; 1:4.8, 88 percent; 1:6, 82 percent; and 1:7.7, 72 percent. The narrower nutritive ratios were also more palatable than the wider ones.

II. *Molting and housing experiments*, H. B. Hinds (pp. 104-120).—Force-molted birds produced fewer eggs during the late summer and early fall when there was a normal shortage of eggs. Normal-molting birds returned a greater gross revenue than birds force molted in June or July. Force-molted birds laid more eggs during the second year than during the first, while the reverse was true of normal birds. Winter egg production was slightly in favor of early force molting. The results as a whole showed that the practice of force molting is not to be recommended.

A comparison between the houseless and housed systems of poultry keeping showed that the average egg production was higher and the food consumption per dozen eggs lower in the housed than in the houseless group. Mortality was also lower in the group having access to a house. Precipitation did not seem to affect the production of houseless birds, but it might influence food consumption. Temperature was largely responsible for the success or failure of the houseless method of poultry keeping. Variations in temperature in the general types of houses used in the Salt River Valley were not significant, and there were only slight differences in percentages of humidity. Air circulation tests indicated no structural defects except in houses with an opening between the plate and roof. Plans are presented for a house suited to this region.

The microscopic anatomy of the digestive tract of *Gallus domesticus*, M. L. CALHOUN (*Iowa State Col. Jour. Sci.*, 7 (1933), No. 3, pp. 261-381, pls. 39).—A study was made of the microscopic anatomy of the entire digestive tract of the normal domestic fowl at different ages. The detailed structure of all the organs involved is described. These descriptions should be valuable to pathologists as a standard for comparison in studies on the effects of disease on organs.

Gross assimilation of yolk and albumen in the development of the egg of *Gallus domesticus*, A. L. and A. J. ROMANOFF (*Anat. Rec.*, 55 (1933), No. 3, pp. 271-278, figs. 4).—Studies at the New York Cornell Experiment Station showed that during embryonic development the yolk and albumen of the hen's egg undergo profound changes, most of which involve the transference of water from one part of the egg to another. During the early stages of incubation the water content of the albumen decreases rapidly, and there is a noticeable swelling of the yolk. A large portion of this transferred water goes into the formation of embryonic membranes, some indirectly for the growth of the embryo, and some is lost through external evaporation. As a result of these changes the yolk first gains in moisture content, then decreases, and after 2 weeks' incubation returns to its original value. The dry substance of the albumen is almost exclusively assimilated during the second half of incubation and completely disappears just before hatching. The dry substance of the yolk is gradually assimilated from the beginning of incubation, a large portion being used just before hatching, but a considerable part is used after the chick leaves

the shell. The decrease in the combined dry weight of yolk and albumen is directly proportional to the progressive development of the embryo.

Studies in embryonic mortality in the chick.—I, The effect of diet upon the nitrogen, amino-nitrogen, tyrosine, tryptophan, cystine, and iron content of the proteins and on the total copper of the hen's egg, W. D. McFARLANE, H. L. FULMER, and T. H. JUKES (*Biochem. Jour.*, 24 (1930), No. 6, pp. 1611-1631, fig. 1).—Studies at the Ontario Agricultural College showed that the source of protein in the diet of the hen had a marked effect on the mortality of the embryos during incubation. No significant difference was found in the composition of the protein of eggs of poor and high hatchability. The total ash and iron determinations of the egg yolk proteins showed variations greater than could be accounted for by limitations in analytical methods, but there was little or no evidence that these factors were affected by the diet. The copper content of the eggs was found to be extremely variable.

These results with eggs from hens on different diets did not explain the differences in hatchability, nor show the cause of the anemic condition which has been found to be one of the major factors associated with embryo mortality from tankage and meat meal eggs during the early incubation period.

The antiricketic potency of eggs from hens receiving massive doses of activated ergosterol, F. G. McDONALD and O. N. MASSENGALE (*Jour. Biol. Chem.*, 99 (1932), No. 1, pp. 79-83).—In this study the eggs produced during a week by 15 Leghorn pullets fed a normal ration containing 2 percent of cod-liver oil were assayed after the birds had been on feed for 49 days. The egg yolk oil of these eggs had a cod-liver oil vitamin D coefficient of 0.7. A maize oil solution of activated ergosterol having a cod-liver oil coefficient of 10,000 was then fed to the birds for 6 weeks, and the eggs were collected the following week for assay. This method of feeding increased the vitamin D potency of the yolk oil only 185 times. The yolk oil from the eggs produced while the birds were receiving the latter ration was given to baby chicks at levels equivalent to 2 and 25 percent of cod-liver oil, but was found to be less effective at these levels than 2 percent of cod-liver oil.

The fate of the antirachitic factor in the chicken.—II, The effectiveness of the factor administered by mouth and intraperitoneally, W. C. RUSSELL, M. W. TAYLOR, and D. E. WILCOX (*Jour. Biol. Chem.*, 99 (1932), No. 1, pp. 109-118).—Continuing this study (*E.S.R.*, 67, p. 62) at the New Jersey Experiment Stations, essentially the same bone ash percentages were obtained by administering the antirachitic factor by injection as by capsule, either in the form of cod-liver oil or of irradiated ergosterol. If there was any decrease in antirachitic effectiveness of the ergosterol in the body of the chick, it was no greater in the digestive tract than in the tissues. The injected groups weighed considerably less than the fed groups.

The bone ash percentage of the group fed irradiated ergosterol in capsules was significantly less than that of the group fed cod-liver oil in capsules. The outward appearance and lack of external evidence of leg weakness were the same in each group, but the body weight of the ergosterol group was significantly less than that of the group receiving oil. There was no significant difference in the blood serum calcium values for the two groups, but the inorganic phosphorus values were higher in the capsule-fed groups than in the corresponding injected groups. The values for the injected and basal groups were considered normal.

A comparison of the effects of ultra-violet rays and cod-liver oil on the growing organism [trans. title], V. VADIMOV (*Élektrif. Selsk. Khoz.*, 1 (1931), No. 6, pp. 29-36, figs. 3).—In these tests irradiation was begun on the fifth day

after hatching, starting with a 1-minute exposure the first day and increasing the time 1 minute each day up to the tenth day. At the end of 9 days the average weight of chicks fed cod-liver oil was 38.9 g and of those exposed to ultraviolet light 40.4 g. On the twenty-fifth day of exposure the difference amounted to only 9 g in favor of the irradiated chicks, but in general appearance these chicks were better than those fed cod-liver oil. Exposing the chicks for an additional 10 days resulted in a loss in weight, but this condition was corrected by discontinuing the irradiation.

Cod-liver oil for laying pullets, J. H. MARTIN and W. M. INSKO, JR. (*Kentucky Sta. Bul.* 337 (1933), pp. 22, fig. 1).—The effect of cod-liver oil when included in the ration of White Leghorn pullets either confined to a house, allowed sunshine, or having access to bluegrass range, on egg production, egg size, and fertility and hatchability was studied. A total of 6 pens of birds was used during each of the 3 years of the experiment, the pens consisting of 30, 25, and 25 pullets each in the respective years. Two pens were housed under each of the above conditions, one of which received the basal ration only and one received in addition 2 percent of cod-liver oil.

The addition of cod-liver oil, access to sunshine or bluegrass range, or any combination of these brought about a decided increase in egg production. Cod-liver oil had more effect on egg production when added to the ration of birds confined to the house with no direct sunlight than when added to the ration of birds receiving sunlight. When used in the ration of birds on bluegrass range cod-liver oil did not increase egg production to any marked extent except during one winter when there was little sunshine. The eggs from the pens receiving cod-liver oil were slightly smaller than those from the corresponding pens receiving no oil.

Each of the vitamin D supplements increased the average hatchability above that of the pen confined without a supplement. Cod-liver oil brought about a marked increase in hatchability when added to the ration of the confined pullets, slightly improved hatchability in the lot receiving sunshine, but had no effect on the hatchability of the lot on bluegrass range except during the one winter. It is concluded that under Kentucky conditions of sunshine and bluegrass range no supplement to the basal ration is needed to assure high hatchability.

Paraffin vs. asphalt base oils in maintaining egg grades in storage, T. L. SWENSON, R. R. SLOCUM, and L. H. JAMES (*Amer. Creamery and Poultry Prod. Rev.*, 75 (1932), No. 1, pp. 20, 21, figs. 5).—The U.S.D.A. Bureau of Chemistry and Soils made a study to determine which of the physical properties of oils are most effective in preventing shell egg deterioration during storage. A group of five lots of eggs was used in the test, of which four lots were oiled each with a different oil while the fifth lot was unoiled. Oiling was done by the vacuum carbon dioxide method.

After nine months' storage all of the oiled eggs graded higher than the check lot. There were no significant differences in the preservative efficiencies of oils of paraffin or asphalt base. The oils whose pour points were higher than the storage temperature were most efficient in maintaining egg grade.

The rearing of chickens, R. T. PARKHURST (*[Gt. Brit.] Min. Agr. and Fisheries Bul.* 54 (1932), pp. V+24, pls. 3, figs. 3).—In this bulletin the more important principles of dealing with the raising of chicks are outlined, and some of the more common problems that arise in practice are discussed.

Turkeys, H. M. BAKER (*[Baltimore]: Author, 1933, 2. ed., rev., pp. 239*).—A practical treatise dealing with management, incubation and brooding, feeding practices, and feeds that have been found to be successful under actual farm conditions.

Turkey raising under conditions of semi-confinement, L. N. BERRY (*New Mexico Sta. Bul.* 208 (1933), pp. 15, figs. 3).—A practical bulletin dealing with the method of raising turkeys on limited range and containing observations regarding management practices when this system is used in New Mexico.

DAIRY FARMING—DAIRYING

Dairying (*U.S.Dept.Agr. Yearbook* 1933, pp. 275–302, figs. 2).—Under this heading the following general articles are listed: Changing Dollar Value and Production Cycle Greatly Affect Dairying, by E. W. Gaumnitz, E. E. Vial, and J. B. Shepard (pp. 275–280); Breeding Better Dairy Cattle Facilitated by Studies in Genetics, by M. H. Fohrman (pp. 280–284); Better Feed Crops and Pastures Needed to Cut Dairy Production Costs, by T. E. Woodward (pp. 284–287); Records that Show Each Cow's Output Are Basis of Successful Dairying, by J. C. McDowell (pp. 287–290); Quality in Dairy Products Depends on Numerous Factors Other than the Butterfat, by W. White and C. J. Babcock (pp. 290–295); Dairy Products' Nutritive Value Justifies Large Place in Family Diet, by R. S. Carpenter (pp. 295–298); and Problem of Finding Uses for By-products of Dairy Industry Partly Solved, by L. A. Rogers (pp. 299–302).

[Investigations in Massachusetts with dairy cattle and in dairying] (*Massachusetts Sta. Bul.* 293 (1933), pp. 25–27, 47, 48).—Data are reported on studies of milk substitutes in the growing of young calves, by J. B. Lindsey; and on the chemistry of pasture grasses, by J. G. Archibald and E. Bennett.

In dairying, information was obtained on the making of ice creams high in fat content, by M. J. Mack; the effect of high initial aging temperatures on certain physicochemical properties of gelatin dispersions and the theoretical causes of the factors involved in the high initial aging temperature phenomena, by W. S. Mueller; and the feasibility of high aging temperatures in the manufacture of ice cream, by Mueller and J. H. Frandsen.

Experiments on rationing of silage to cows, C. N. DAVE and H. SINGH (*Agr. and Livestock in India*, 2 (1932), No. 1, pp. 13–22).—The results of an experiment by the Imperial Department of Agriculture, Bangalore, showed that cows fed 17.2 lb. of silage per head daily with ragi straw ad libitum and grain in proportion to milk yields produced as much milk as cows receiving an average of 29.2 lb. of silage per head per day. Because the cows in the first group consumed more straw, the total feed consumption was approximately the same in both lots. The favorable results obtained were attributed to the use of chaffed fodder.

Vitamin D in the nutrition of the dairy calf, I. W. RUPEL, G. BOHSTEDT, and E. B. HART (*Wisconsin Sta. Res. Bul.* 115 (1933), pp. 40, figs. 19).—Continuing this study (*E.S.R.*, 65, p. 465), a total of three experiments showed definitely that calves fed a ration deficient in vitamin D begin to decline in growth rate from about the twelfth to the fifteenth week and that little growth occurs after the twenty-fifth to thirtieth week. The deficiency of vitamin D was manifested by reduced growth, by stiffness, progressive emaciation, and deformity of the bones and enlargement of the joints, by a reduction in the level of blood serum inorganic phosphorus and calcium, and by a reduction in the percentage of total ash in the dry fat-free bone. Oxidized cod-liver oil, sunlight, and ultraviolet radiation were satisfactory sources of the antirachitic factor when the dosages were adequate. A liberal allowance of sun-cured hay of the kind and grade suitable for calves furnished an abundance of vitamin D.

Increasing the vitamin D content of milk, W. C. RUSSELL (*New Jersey Stas. Circ.* 285 (1933), pp. 2).—Various methods are discussed for increasing the

vitamin D content of milk to a point where it will promote normal bone formation when consumed in the usual amounts.

Cooling milk on the farm, C. K. JOHNS (*Canada Dept. Agr. Bul. 165, n. ser. (1933), pp. 28, figs. 17*).—The farm cooling of milk as a means of preventing losses due to spoilage caused by bacteria is discussed. The various methods of cooling, such as surface coolers and cooling tanks with water and ice and electric coolers, are described. Appended are detailed instructions for the construction of an insulated milk-cooling tank.

The bacterial flora of high-grade milk before and after pasteurization, L. M. THURSTON and H. C. OLSON (*West Virginia Sta. Bul. 255 (1933), pp. 24, figs. 6*).—The milk used in this study was mostly machine-drawn, and conditions were so controlled that the milk usually had a standard plate count lower than 10,000 bacteria per cubic centimeter before pasteurizing. Samples were taken before and after pasteurizing at $145^{\circ}\text{ F.} \pm 0.5^{\circ}$ (62.8° C.) for 30 minutes. A machine-filled bottle obtained after the milk had been pumped over a covered surface cooler and passed into the covered tank of a bottler was also used for examination. Two tests of bacterial reduction by pasteurization were made, using the Standard Methods of Milk Analysis, except that in one test the agar used contained 1 percent of lactose.

Under the conditions of this study, pasteurizing low-count milk changed the bacterial flora so that on subsequent storage acid developed slowly. Coagulation occurred at low acidities, probably due to the production of a rennin-like enzyme by the bacteria. There was no tendency for peptonizing bacteria to overgrow other types in raw or pasteurized bottled milk held for 4 days at temperatures ranging from 36° to 56° F. The pasteurized bottled milk had a decided tendency to develop a "cappy" flavor after 2 days' storage at the above temperatures.

High short holding and low long holding, J. D. QUINN and L. H. BURGWALD (*Milk Plant Mo., 22 (1933), No. 2, pp. 26–31, 36, figs. 2*).—In this study it was found that there was practically no difference in the germicidal efficiency of a pasteurizing temperature of 160° or 162° F. for from 15 to 20 seconds as compared with a temperature of 143° for 30 minutes under laboratory conditions. Under commercial conditions, however, the long period was slightly more efficient than the short period. The low-temperature long-holding period was less detrimental to the creaming ability of the milk than the high-temperature short-holding period in all cases. Holding milk at 160° or 162° for from 25 to 60 seconds did not seem to increase the germicidal efficiency in laboratory tests, but the prolonged holding decreased the creaming ability of the milk. When the high-temperature short-holding method of pasteurizing is used, the temperature of the heating medium should not be materially higher than that to which the milk is to be heated, otherwise there is a detrimental effect on the creaming ability of the milk. The high-temperature short-time holding period imparted less "cooked" flavor to milk than did pasteurizing at 143° for 30 minutes.

Whipping properties of cream as influenced by freezing and thawing, F. B. BALDWIN, JR., and W. B. COMBS (*Milk Plant Mo., 22 (1933), No. 1, pp. 18–21, figs. 3*).—At the Minnesota Experiment Station it was found that partial freezing and thawing of raw milk prior to separation did not affect the whipping qualities of the resulting cream. Partial freezing and thawing of raw cream containing from 9.4 to 92.9 percent solids did not affect its whipping properties, but total freezing and thawing of such cream destroyed them. Pasteurizing cream containing 30 percent fat decreased the time required to whip it. Total freezing but not partial freezing altered the original cream emulsion.

The theory and practice of ice cream making, H. H. SOMMER (*Madison, Wis.: Author, 1932, pp. [5]+VII+611, pls. 4, figs. 60*).—This treatise points out the proven practices, indicates the equipment required in the manufacture and distribution of ice cream, and explains on a scientific basis so far as possible the factors that affect the quality of ice cream.

The effect of source of butterfat on ice cream's overrun and quality, P. S. LUCAS (*Ice Cream Trade Jour., 28 (1932), No. 11, pp. 54-56*).—At the Michigan Experiment Station a study was undertaken to determine the effect on overrun and quality of ice cream of the substitution in varying degrees of fat from unsalted butter for fat from sweet cream and the effects of 24- and 48-hour aging periods on these substitutions. The effect of the substitution in varying degrees of skim milk powder for condensed skim milk on overrun and quality of ice cream was also studied.

The mixes in which fat from butter was used and which had been aged for 24 hours reached a greater maximum overrun and arrived at this maximum in a shorter time than mixes made with sweet cream. Mixes containing from 5 to 10 percent of fat from butter scored slightly higher than those made from cream. Larger amounts of fat from butter lowered the quality of the body and the texture of the resulting ice cream. On exposure butter mixes melted much more rapidly and in almost direct ratio to their butter content. Similar results were obtained when the mixes were aged for 48 hours.

Supplying all of the serum solids with skim milk powder slightly hastened the incorporation of overrun and made possible a slightly greater overrun. There was no significant difference in quality or resistance to melting of ice cream made with condensed skim milk or skim milk powder.

Are liquid colors in ice cream a source of bacterial growth? H. A. SMALL-FIELD (*Ice Cream Trade Jour., 29 (1933), No. 3, pp. 41-44*).—The Ontario Agricultural College found that the color which is used to give a desirable shade to colored ice creams may be a serious source of bacterial contamination. The method of dissolving powdered colors in water invites rapid growth of bacteria. The commercial liquid colors might or might not have high bacterial counts, but the powdered colors were relatively free from organisms. The bacterial flora of liquid colors was not uniform as to species.

It is recommended that in order to prepare colors with a low bacterial count they may be made in one of the following ways: (1) Dissolve the powder in a 45 percent sugar solution, heat to 180° F. or higher, and bottle in a sterilized container; (2) dissolve the powder in water containing 10 percent of alcohol and bottle; and (3) mix the dry color with pulverized sugar 1:4 and keep in a tightly closed container. The liquid colors should be made in such quantities as can be used within a relatively short time.

How can we control the off-flavor appearing in strawberry ice cream? C. D. DAHLE and E. C. FOLKERS (*Ice Cream Trade Jour., 28 (1932), No. 12, pp. 37-39, fig. 1*).—Continuing the study of off flavors in strawberry ice cream (*E.S.R., 66, p. 269*), the Pennsylvania Experiment Station found this defect was due to a combination of copper and the acid of the berries. The source of copper was the milk ingredients used that had been in contact with copper surfaces. When the copper contamination of the mix was 0.8 p.p.m., no off flavor occurred. Neutralizing the acid of the berries to pH 7 prevented the development of off flavors, but the practice could not be recommended. Heating the mix and the berries to 180° F. for 1 hour did not prevent the trouble. Using "cardboard" flavored cream in the mix did not cause this off flavor when the copper content was low.

Sterilization of ice cream freezers, A. C. DAHLBERG and J. C. MARQUARDT (*New York State Sta. Bul. 628 (1933), pp. 20*).—Because the problem of sterili-

zation of ice cream freezers has been little studied experimentally, this project was undertaken to determine whether steam, hot water, or a chlorine solution was best suited to this purpose.

The chlorine solution failed to penetrate the bearings of the freezer, and bacteria subsequently developed in the wet freezer. Because the cold refrigerant surrounding the freezer chilled hot water, excessively large amounts at very high temperatures were required to sterilize the freezer when this method was used. While heating by steam was slow, this method was satisfactory. Steam sterilization was particularly effective since it dried the freezer and also sterilized the bearings. Rinsing the freezer with a chlorine solution prior to use was an efficient supplement to steam sterilization.

Laboratory manual: Methods of analysis of milk and its products (*Chicago: Internatl. Assoc. Milk Dealers, 1933, pp. XXIV+461, figs. [142]*).—This laboratory handbook was compiled by the Laboratory Committees on Research and Methods of the International Association of Milk Dealers. It includes directions for procedure and practical tests and analyses that may be made in a milk plant laboratory, including those of the American Public Health Association Standards of Analysis, and supplements the different tests in such a way as to make them more practical.

Twentieth and twenty-first annual reports of the International Association of Dairy and Milk Inspectors, compiled by P. B. BROOKS (*Internatl. Assoc. Dairy and Milk Insp. Ann. Rpts., 20 (1931), pp. 340, figs. 25; 21 (1932), pp. 306, figs. 11*).—These are the usual reports of the annual meeting, held at Montreal, Canada, September 10–12, 1931 (E.S.R., 65, p. 865), and at Detroit, Mich., October 19–21, 1932.

Of these the first includes the following papers: Municipal Milk Control in Montreal, by A. J. G. Hood (pp. 43–48); The Florida Milk Law, by J. M. Scott (pp. 49–57); Measuring Efficiency of Municipal Milk Control, by I. V. Hiscock (pp. 59–71); Report of the Committee on Dairy and Milk Plant Equipment, by G. W. Putnam (pp. 73–77); High Temperature, Short-time Pasteurization, by C. A. Holmquist (pp. 79–100); The Relation of High Temperature, Short-time Pasteurization to the Number of Thermophiles in Milk, by M. W. Yale and R. S. Breed (pp. 101, 102); The Temperature Behavior of Milk Pasteurizers of the Thirty-minute Holding Type, by L. C. Frank, F. J. Moss, and P. E. LeFevre (pp. 103–118); Effects of Cattle Feeding and Pasteurization on Food Value of Milk, by E. Scott and L. A. Erf (pp. 119–136); To What Extent Should We Encourage Pasteurization? by H. F. Vaughan and R. Palmer (pp. 137–145); Report of Committee on Food Value of Milk and Milk Products, by I. V. Hiscock (pp. 146–150); Report of Committee on Milk Plant Practice, International Association of Dairy and Milk Inspectors, by H. A. Harding (pp. 151–160); Certified Milk and Its Relation to Market Milk, by H. N. Heffernan (pp. 161–168); Factors Affecting the Accuracy of Bacterial Counts, by A. H. Robertson (pp. 169–181); The Creaming of Milk, by A. C. Dahlberg (pp. 181–196); The Influence of Alkalinity upon the Efficiency of Hypochloride, by C. K. Johns (pp. 197–209); Report of Committee on Laboratory Methods, by G. E. Bolling (pp. 210–214); Use of a Photographic Standard in the Microscopic Examination of Raw Milk, by K. M. Royer (pp. 215–222); Running Down the Causes of High Bacteria Counts in Milk, by J. D. Brew (pp. 318–331); Report of Committee on Dairy Farm Methods, by T. J. Strauch (pp. 332, 333); and Report of the Committee on Communicable Diseases Affecting Man, by H. N. Parker (pp. 334–340).

The second report includes the following papers: Methods of Controlling the Bacterial Content of Pasteurized Milk, by C. T. McCutcheon and H. A. Harding (pp. 28–39); A Study of Some Physical and Chemical Properties of Several

Dairy Cleaners, by P. S. Lucas, B. Hartsuch, and H. J. Barnum (pp. 40-47); Economic Aspects of Milk Control, by L. Spencer (pp. 48-66); California's Market Milk Control Program, by M. A. Heinzman (pp. 67-75); Raw Versus Pasteurized Milk from the Nutritive Standpoint, by W. E. Krauss (pp. 76-89); The Titratable Acidity of Milk, by H. H. Sommer (pp. 90-100); Symposium on Nutritional Quality Developments in Certified Milk—Soft Curd Milk, by C. I. Corbin (pp. 101-105); The Production of Antirachitic Milk by the Feeding of Dairy Cattle, by J. G. Hardenbergh and L. T. Wilson (pp. 106-122); Responsibility of Milk Commissions for Control of Nutritive Factors in Certified Milk, by H. Moak (pp. 123-127); Some of the Things We Now Know About Disinfection, by E. C. McCulloch (pp. 148-163); Report of Committee on Methods of Improving Milk Supplies in Small Communities, by H. R. Estes (pp. 164-170); Report of Committee on Laboratory Methods, by G. E. Bolling (pp. 188-191); Comparison Between Methylene Blue and Sediment Test Results, by H. J. Barnum (pp. 192-196); Effect of Certain Factors on Amount of Fat Consumed in Milk Served to School Children, by E. Kelly (pp. 197-201); A Program of Revised Methods of Sanitary Milk Production, by R. S. Craig and J. M. Lescure (pp. 202-213); The Epidemiology of Milk-Borne Streptococcus Infections, by P. B. Brooks (pp. 214-223); Ropy Milk—Its Causes and Correction, by C. N. Stark (pp. 224-235); Thermal Efficiency of Milk Pasteurizer Holders, by P. F. Krueger (pp. 236-245); The Factors of Milk Flavor, by R. M. Washburn (pp. 246-256); Report of Committee on Communicable Diseases Affecting Man, by H. N. Parker (pp. 261-272); Report of Committee on Milk Plant Practice, by H. A. Harding (pp. 273-277); Report of Committee on Sanitary Control of Ice Cream, by R. E. Irwin (pp. 278-280); and Report of Committee on Food Value of Milk and Milk Products, by I. V. Hiscock (pp. 281-306).

VETERINARY MEDICINE

Manual of veterinary bacteriology, R. A. KELSER (*Baltimore: Williams & Wilkins Co., 1933, 2. ed., pp. IX+552, figs. 93*).—This is a revised edition of the work previously noted (E.S.R., 57, p. 669). A chapter on the outstanding phases of bacterial variation as at present conceived, prepared by J. S. Simmons, and an introductory chapter to the section on the Protozoa, by C. F. Craig, are included. The classification has been revised to conform to that of the forthcoming edition of Bergey's Manual of Determinative Bacteriology.

Practical hematological diagnosis, O. H. P. PEPPER and D. L. FARLEY (*Philadelphia and London: W. B. Saunders Co., 1933, pp. 562, pls. 3, fig. 1*).—Part 1 of this work deals with the components of the blood, the methods of their study, and the significance of the results obtained (pp. 17-229), part 2 with hematological diagnosis of the diseases of the hemopoietic system (pp. 230-351), and part 3 with hematology of diseases not primarily of the blood (pp. 352-520).

A text-book of the diseases of the small domestic animals, O. V. BRUMLEY (*Philadelphia: Lea & Febiger, 1931, 2. ed., rev., pp. XXI+611*).—A thoroughly revised edition of the work previously noted (E.S.R., 46, p. 276).

Department of veterinary science (*Massachusetts Sta. Bul. 293 (1933), pp. 56-58*).—The work of the year (E.S.R., 67, p. 457) is briefly reported upon under the headings of Poultry Disease Elimination Law and pullorum disease investigations, both by H. Van Roekel, K. L. Bullis, O. S. Flint, and M. K. Clarke (E.S.R., 68, p. 821); and infectious laryngotracheitis, including the Massachusetts plan for the eradication and control of infectious laryngotracheitis, infectious bronchitis due to a streptococcus (E.S.R., 68, p. 819), and avian paralysis or neurolymphomatosis, all by C. S. Gibbs.

Report on the Veterinary Department, Burma, for the year ending the 31st March 1932, D. T. MITCHELL (*Burma Vet. Dept. Rpt. 1931-32, pp. [5]+*

37, pls. 4).—An account of work (E.S.R., 67, p. 596) with diseases of animals (pp. 3–5) is followed by reports on contagious diseases in animals (pp. 5–10), veterinary education (p. 11), veterinary research (pp. 12–16), and a survey of the year's working results and recommendations (pp. 16–21).

[Contributions on animal pathology] (*Arch. Wiss. u. Prakt. Tierheilk.*, 62 (1930), Nos. 1, pp. 1–108, figs. 42; 2, pp. 113–205, figs. 14; 3, pp. 209–313, figs. 19; 4, pp. 315–437, figs. 40; 5, pp. 439–546, figs. 36; 62 (1931), No. 6, pp. 551–631, figs. 14).—The contributions presented (E.S.R., 69, p. 579) include the following: The Symptoms of Carbon Tetrachloride Poisoning in the Horse as Influenced by the Calcium Content of the Blood, by K. Neumann-Kleinpaul and K. Pelckmann (pp. 1–75); The Bilirubin Content of the Blood of the Horse after Administration of Carbon Tetrachloride, by W. Grassnickel (pp. 76–88); Paratyphoid Infection (*Bact[erium] enterit[idis]* Gärtner.) in the Drake with Marked Testicular Changes, by G. Pallaske (pp. 89–96); Giant Celled Xanthoma in the Subcutis of a Horse, by O. Nitsche (pp. 97–102); Experimental Investigations of the Value of Some Surgical Operations on the Intestinal Canal of the Horse, by P. P. Timofceff (pp. 103–108); Contributions to the Knowledge of the Leucosis of Fowls, by K. Jármai (pp. 113–131); Can the Peripheral Blood Picture, Particularly the Erythrocyte Content of the Blood, Be Altered through Mechanical Stimulation of the Spleen of the Horse? by M. Pabl (pp. 132–156); Reduction of Erythrocytes in Normal and in Pancreas and Spleen Excised Dogs, by M. Dalmatoff (pp. 157–163); Further Pharmacological Investigations on the Isolated Uterus of Cattle—Tyramine, by H. Graf and G. Seifert (pp. 164–170) (E.S.R., 65, p. 869); Further Pharmacological Investigations on the Isolated Uterus of Cattle—Ephedrine, by H. Graf and G. Harberg (pp. 171–177); Contribution to the Bacteriological Diagnosis of Anthrax, by R. Standfuss and G. Pohl (pp. 178–197); Morphological Changes of the Blood in Experimental Foot-and-Mouth Disease of Cattle, by A. A. Dorofejew (pp. 198–205); Infectious Paralysis of Fowls, by O. Seifried (pp. 209–222); Histology of the Eye Alterations in the A-Avitaminosis of Fowls, by O. Seifried and M. Westhues (pp. 223–236); Investigations of the Serological Diagnosis of Tuberculosis of the Bovine—III, The Diagnosis of Open Pulmonary Tuberculosis, by K. Beller (pp. 237–247) (E.S.R., 65, p. 869); Knowledge of the Chemical Composition of Animal Fats and a Contribution to So-called Feder's Number, by H. Ömer (pp. 248–266); A Contribution on the Hormone Influencing of Sex—Preliminary Account, by K. Schouppé (pp. 267–270); The Use of Yeast in the Treatment of Cecal Obstruction in the Horse, by K. Neumann-Kleinpaul and W. Grassnickel (pp. 271–300); Blood Pressure in Cecal Obstruction of the Horse, by S. Mglej (pp. 301–313); Investigations of Hog Cholera, by W. David and M. Schwarz (pp. 315–344); Histological Investigations of Hog Cholera—I, Lymph Node Changes in Acute Cases, by H. Röhrer (pp. 345–372); On the Elimination and Decomposition of Neosalvarsan and of Myosalvarsan in the Body of the Horse and of the Rabbit, by Richters (pp. 373–396); On the Injuries Resulting from Intravenous Administrations of Salvarsan and the Histochemical Evidence, by O. Nitsche (pp. 397–410); On the Knowledge of Hemorrhagic Septicemia of the Reindeer (Reindeer Epidemic of Magnusson), by K. Nieberle and G. Pallaske (pp. 411–428); Horse Leech Invasion of the Throat of the Large Domestic Animals in Bulgaria: A New Method of Control, by X. Iwanoff (pp. 429–437); Histological Investigations of Hog Cholera—II, Changes in the Central Nervous System in Acute Cases, by H. Röhrer (pp. 339–462) (see above); Further Studies of the Plurality of the Foot-and-Mouth Disease Virus, by K. Trautwein and K. Reppin (pp. 463–482); Transmission of Foot-and-Mouth Disease to the Dog, by K. R. Höve (pp. 483–488); Destruction

of the Virus of Foot-and-Mouth Disease by Heat and Hot Disinfectant Solutions, by R. Helm and W. Curtze (pp. 489-506); A New Pleximeter, by K. Neumann-Kleinpaul (p. 507); The Blood Pressure of Horses with 39° of Temperature—Preliminary Contribution, by W. Rüscher and M. Sonntag (pp. 508-514); Paralysis of the Vestibule of the Ear of the Dog and Its Patho-anatomical Basis, by S. Cliza (pp. 515-531); Dislocation of the Ulna and of the Radius, a Congenital and Transmitted Deformity of the Dog, by W. Baier (pp. 532-542); The Anaplasmosis of Sheep in the Uralsk Government (U.S.S.R.), by W. L. Yakimoff, S. A. Amanschuloff, N. P. Arbuzoff, and A. A. Samarzeff (pp. 543-546); Investigations of the Leukemia of Fowls, by Lüttschwager (pp. 551-566); So-called Diaphragmatic Hernia in Domestic Animals and a Contribution on Renal Impotence of the Horse, by C. Krause (pp. 567-601); Osteitis Fibrosa in the Dog, by W. Stockmayer (pp. 602-616); and A Rare Double Monster Calf, by J. Andres (pp. 617-631).

On hypocalcaemic morbid conditions in domestic animals, B. CARLSTRÖM (*Skand. Vet. Tidskr.*, 23 (1933), No. 5, pp. 229-272, fig. 1; *Swed. abs.*, pp. 269-271).—This contribution deals with the morbid conditions of metabolism characterized by a diminished total amount of lime in the blood and clinically either by a hyperirritation of the nervous system and the musculature, resulting in clonic and tonic, general and local, cramps, which often make their appearance periodically, or by a diminished central irritability with paresis, sopor, and coma.

The virus diseases of animals, with special reference to those of poultry, T. M. DOYLE (*Jour. Compar. Path. and Ther.*, 46 (1933), No. 2, pp. 90-107).—This is a digest of information presented at the Royal Veterinary College in February 1932 in the form of two lectures.

Symposium on bacterial variation (*Jour. Bact.*, 25 (1933), No. 6, pp. 545-593, pls. 3, figs. 5).—Abstracts here given of papers presented at the annual meeting of the Society of American Bacteriologists at Ann Arbor, Mich., in December 1932 are as follows: Observations on Amorphous Phases of Bacteria, by J. Broadhurst (pp. 545-563); Some Pitfalls in Bacteriology, by M. Frobisher, Jr. (pp. 565-571); The Relation of the Bacterial Variants of Kuhn to the Chief Phases in Microbic Dissociation, by P. Hadley (pp. 572-575); Atypical Acid-Fast Organisms—II, Some Observations on Filtration Experiments, by M. Pinner (pp. 576-579); A Hypothetical View of Bacterial Variation, by G. B. Reed (pp. 580-586); and Notes on Life Cycle Phenomena and Filtrability of the Tubercle Bacillus, by H. C. Sweany (pp. 587-593).

Anaplasmosis.—V, The nature of Anaplasma, G. DIKMANS (*Jour. Amer. Vet. Med. Assoc.*, 83 (1933), No. 1, pp. 101-104).—In this further contribution (E.S.R., 69, p. 582) the author is led to "conclude that (1) *Anaplasma* (sensu stricto) is not a phase in the life history of a member of the family Piroplasmidae; (2) *Anaplasma* is not a form of Jolly bodies; (3) *Anaplasma* is not a 'reaction product' set up by an ultravisible, filtrable virus; (4) *Anaplasma* may be a 'reaction product' set up by an ultravisible, unfiltrable virus; (5) *Anaplasma* may be a parasite sui generis.

"On the basis of the evidence so far at hand, both points 4 and 5 can be maintained. Neither the question of filtration nor the question of artificial cultivation has so far received enough attention to permit of a final conclusion."

Studies on Clostridium chauvoei, I, II, D. W. HENDERSON (*Brit. Jour. Expt. Path.*, 13 (1932), No. 5, pp. 412-427).—The first contribution (pp. 412-420) reports an analysis of the H and O antigens of *C. chauvoei* and the second (pp. 421-427) an active immunization with pure O antigen. It was found that *C. chauvoei* strains of bovine and ovine origin possess a labile H antigen and a stable O antigen, and that the pure O antigen of *C. chauvoei* is a powerful immunizing agent. The O antigen is identical in strains of bovine and ovine origin and induces complete cross-immunity with all strains tested. Heating for

prolonged periods up to two hours at 100° C. does not lower appreciably the immunogenic value of the O antigen. Steamed suspensions of *C. chauvei*, being reliable, sterile, and innocuous, may prove of value as prophylactic vaccines in the field.

The transmission of louping ill to field voles, G. M. FINDLAY and C. ELTON (*Jour. Compar. Path. and Ther.*, 46 (1933), No. 2, pp. 126-128, fig. 1).—It was found that the field vole *Microtus agrestis* is susceptible to infection with the virus of louping ill, the clinical symptoms and histological appearances resembling those found in the mouse. It thus differs from rabbits, guinea pigs, and rats, which are only very slightly if at all susceptible to the virus of louping ill. This susceptibility is of some interest, since field voles are of common occurrence in hill pastures such as are known to be infected with louping ill.

Experiments in the transmission of *Trypanosoma hippicum* Darling, with the vampire bat *Desmodus rotundus murinus* Wagner as a vector, in Panama, L. H. DUNN (*Jour. Prev. Med.*, 6 (1932), No. 5, pp. 415-424).—This contribution supplements the account previously noted (E.S.R., 69, p. 592). The positive results obtained in five of the six experiments in the transmission of murrina, the equine disease due to *T. hippicum*, through the agency of *D. rotundus murinus* here reported are considered to prove definitely that this bat is a vector of the disease.

Bacteriological studies of dried milk powders, J. E. FULLER and R. L. FRANCE (*Massachusetts Sta. Bul.* 293 (1933), p. 14).—Negative results as to tubercle bacilli are reported of tests made in which guinea pigs (1) ingested and (2) were inoculated with milk powder dried by the roller and the spray process.

The isolation from the Rocky Mountain wood tick *Dermacentor andersoni* of strains of *Bact. tularensis* of low virulence for guinea pigs and domestic rabbits, G. E. DAVIS, C. B. PHILIP, and R. R. PARKER (*Jour. Bact.*, 25 (1933), No. 1, p. 87).—In this contribution data are presented as evidence that strains of *Bacterium tularensis* of low virulence occur in nature, three such strains having been isolated in 1932 from specimens of *D. andersoni* collected in western Montana.

Trichomonads in connection with abortion in cattle, L. RIEDMÜLLER (*Jour. State Med.*, 38 (1930), No. 1, pp. 40-47).—Under the name *Trichomonas bovis* the author describes an organism which in the earlier examinations he found present in not less than 8.5 percent of the cases of abortion observed in cattle and later in 7.8 percent of 127 examinations, having detected it in 9 fetuses of cattle and in 1 fetal stomach. He reports upon the morphology, experimental transplantation, and clinical significance of the organism.

In only 2 of 13 cases were trichomonads from the fetus of cattle transmitted to guinea pigs and cultivated by successive passages. "The trichomonads are found in the peritoneal and pleural cavity, in the pericardium, the uterus, even in the subcutis, a fact which corresponds to the existence of the agent in the different cavities, sporadically in the subcutis, and even in the sterile heart blood of the fetus of cattle. In intraperitoneal transplantation experiments made on over 60 guinea pigs, gravid guinea pigs were affected with abortion, or premature birth. In some cases death occurred before the passing out of the fetus. Only about 10 percent of the animals showed themselves refractory, not the slightest appearance being discernible in them."

The clinical and laboratory experiences lead the author to assume a pathogenic significance for the flagellates, as described in his contribution on the subject published in 1928.²

A list is given of 29 references to the literature.

² Centbl. Bakt. [etc.], 1. Abt., Orig., 108 (1928), No. 1-4, pp. 103-118, figs. 4.

The etiological importance of trichomonads in pyometra and sporadic abortion of cattle [trans. title], L. RIEDMÜLLER (*Schweiz. Arch. Tierheilk.*, 74 (1932), No. 7, pp. 343-351; *abs. in Vet. Bul.*, 3 (1933), No. 6, p. 298).—A report is made of two cases of sporadic abortion, one that occurred in a cow at 27 weeks and the other in a heifer with the first calf at 20 weeks. In microscopical, cultural, and serological studies *Brucella abortus* and other bacteria were shown to be absent, but trichomonads were present in pure culture in large numbers in both the stomach contents and peritoneal fluids of the fetuses. In complement-fixation tests made with an antigen prepared from washed trichomonads from the peritoneal fluids of two inoculated guinea pigs, both animals proved positive. Tests made 4 weeks later in one case and 8 weeks later in the other gave doubtful results. Uninfected animals gave negative results. *Trichomonas bovis* is considered to differ from the human form (*T. vaginalis*) both morphologically and in its ability to infect guinea pigs.

Trichomonads associated with breeding troubles in cattle, S. H. McNUTT, F. E. WALSH, and C. MURRAY (*Cornell Vet.*, 23 (1933), No. 2, pp. 160-168).—This is an account of a protozoan to which the name *Trichomonas bovis* has been given by Riedmüller, as above noted. The evidence accumulated indicates that it is pathogenic, and that once established in a herd it leads to much trouble in breeding, including pyometra, endometritis, vaginitis, and abortion. This study has shown that the trichomonad infection, which is known to occur in Europe, extending through northern Italy, Switzerland, and into central Europe and southern Germany, and which has been reported by Emmerson as present in Pennsylvania (E.S.R., 68, p. 530), occurs in Iowa. A pathological process is here described in which only trichomonads were found, the condition being fairly well reproduced in experimental animals and the trichomonads found present. It is pointed out that the possibility of a filtrable virus associated with the condition has not been eliminated.

Contagious abortion (Bang's disease), W. L. HINDMARSH (*N.S. Wales Dept. Agr. and United Pure-Bred Dairy Cattle Breeders' Assoc.* [Pam. 1] (1932), pp. 12).—A practical summary of information.

Bovine contagious abortion: The need for further research, H. R. SEDDON (*N.S. Wales Dept. Agr. and United Pure-Bred Dairy Cattle Breeders' Assoc.* Pam. 2 (1932), pp. 10).—This account has been noted from another source (E.S.R., 69, p. 273).

Types in *Brucella* recovered from milk in New York State, H. L. GILMAN and C. H. MILKS (*Cornell Vet.*, 23 (1933), No. 2, pp. 150-152).—The authors report having isolated and typed 117 strains of *B. abortus* recovered from milk, of which 113 were bovine and 4 porcine, the 4 latter having been recovered from 3 different herds. While these data cover only a relatively few strains of *B. abortus* present in raw milk, they demonstrate that porcine *Brucella* are present in the milk of some cows in New York State.

Studies of the skin as a portal of entry for *Brucella abortus* in pregnant cattle, W. E. COTTON, J. M. BUCK, and H. E. SMITH (*Jour. Amer. Vet. Med. Assoc.*, 83 (1933), No. 1, pp. 91-100).—In the work reported "4 pregnant cattle were used to test the effects of abraded skin exposure to *B. abortus* (bovine), and 16 pregnant cattle were used to test the effects of intact skin exposure. Following the application of *B. abortus* suspensions to a small area of the abraded skin of 4 cattle, Bang's disease was conferred in all cases. Bang's disease was transmitted to 10 of 16 pregnant cattle following the application of *B. abortus* suspensions to small areas of the intact skin."

A study of actinomycosis, L. R. VAWTER (*Cornell Vet.*, 23 (1933), No. 2, pp. 126-149, figs. 10).—Contributing from the Nevada Experiment Station, the author reports upon the results of work conducted at the New York State

Veterinary College at Ithaca, N.Y., presented in connection with a list of 34 references to the literature. The author considers that the term actinomycosis as customarily used is nonspecific and not necessarily indicative of infection by *Actinomyces bovis*. He suggests that the term actinomycosis be applied only to the bone disturbance usually associated with infection by *A. bovis* or related species, and that the term actinobacillosis be used to designate the disturbance involving the tongue, cervical lymph glands, and other soft tissues in the head region of cattle.

Lesions in cardiac muscle of young calves as sole evidence of blackleg, C. N. DALE (*Jour. Amer. Vet. Med. Assoc.*, 83 (1933), No. 1, p. 109).—In an autopsy made of a calf 6 months old, from the heart muscle of which *Clostridium chauvei* was cultivated, only a black coloration and a slight emphysema of the heart wall of the right auricle and the upper half of the right ventricle were revealed.

Foot and mouth disease in Southern Rhodesia and a method of emergency inoculation, L. E. W. BEVAN (*Roy. Soc. Trop. Med. and Hyg. Trans.*, 26 (1932), No. 1, pp. 89–93).—The unusual features presented by foot-and-mouth disease in Southern Rhodesia, as previously noted (E.S.R., 67, p. 598), are described. Three methods of emergency inoculation based upon these peculiarities were employed with a view to setting up a mild form of the disease and establishing herd immunity, some 20,000 to 30,000 cattle having been inoculated. The methods have been applied on a very large scale with considerable success, and recent reports indicate that the disease has disappeared from enormous areas which by reason of their inaccessibility appeared to defy all other administrative measures.

Further note on foot and mouth disease in Southern Rhodesia and an emergency method of inoculation, L. E. W. BEVAN (*Roy. Soc. Trop. Med. and Hyg. Trans.*, 27 (1933), No. 1, pp. 105–108).—This contribution, supplementing that above noted, reports that the inoculation of some 185,388 cattle has resulted in the complete elimination of foot-and-mouth disease from the Colony.

Infectious diarrhea (winter scours) of cattle, F. S. JONES (*Cornell Vet.*, 23 (1933), No. 2, pp. 117–122).—This is a practical account based upon investigations previously noted (E.S.R., 68, p. 529).

A note on some recent work in experimental bovine mastitis, P. R. EDWARDS (*Cornell Vet.*, 23 (1933), No. 2, pp. 177–184).—In this contribution from the Kentucky Experiment Station (E.S.R., 69, p. 424), reviewing the work of Hadley and Frost (E.S.R., 69, p. 429), the author summarizes the results obtained at the station laboratory in the study of low-acid-producing nonsodium hippurate-hydrolyzing hemolytic streptococci, the details being presented in tabular form.

It is pointed out that “the term *Streptococcus epidemicus* has been used too loosely, and many animal streptococci have been so designated. Its use should be limited to those streptococci which exhibit the characters considered characteristic of this organism, and which, in addition, are members of the human type. Sorbitol-fermenting streptococci of animal origin should be excluded. . . .

“*S. equi* is a distinct species characterized by its inability to ferment lactose, sorbitol, or trehalose. It should not be confused with other nonlactose-fermenting streptococci. The large majority of the animal streptococci can be distinguished from human strains by their action on sorbitol and trehalose. Sorbitol-fermenting streptococci of animal origin in all probability are not the cause of epidemic septic sore throat and should not be confused with *S. epidemicus*, which is a streptococcus of human origin and resembles the human strains in its biochemical characters.”

The laboratory detection of bovine mastitis, G. J. HUCKER (*New York State Sta. Bul.* 626 (1933), pp. 24, pls. 2, figs. 5).—In continuation of earlier reports of studies conducted (E.S.R., 68, p. 813), the author outlines in detail the procedures used in testing for mastitis in the dairy barn and in the laboratory to detect chronic mastitis. The use and relative merits of the different procedures are discussed as means of controlling subclinical mastitis. The various types of bovine streptococcus mastitis, viz, (1) clinical or acute, (2) subclinical (latent, chronic) mastitis, and (3) septic sore throat mastitis, are discussed. It is suggested that investigators be more specific in discussing the type of infection studied in order to obviate confusion.

A method for the control of mastitis in dairy cows, C. S. M. HOPKIRK (*Aust. Vet. Jour.*, 9 (1933), No. 2, pp. 53-61).—An account is given of a method, still in the experimental stage, which is based upon the grouping of cows in a herd for milking purposes according to the number of leucocytes present in the milk as disclosed by careful microscopical examinations carried out at monthly intervals. The method of diagnosis of mastitis and the application of the plan are considered at length. Mention is made of the fact that on at least three occasions a tendency for streptococci to creep in on an infection of *Bacillus abortus* has been noted.

Streptococcic mastitis of the cow, J. M. ROSELL (*La Mammite Streptococcique de la Vache. Quebec: Min. Agr.*, 1933, pp. [4]+108, pl. 1, figs. 30).—Part 1 of this contribution consists of a discussion of the economic importance of mastitis (pp. 1-5), part 2 the nature of chronic streptococcic mastitis (pp. 6-21), parts 3 (pp. 22-58) and 4 (pp. 59-80) diagnosis of the disease, and part 5 the treatment of chronic streptococcic mastitis (pp. 81-102). Supplementary data are given in an appendix (pp. 103-105), followed by a bibliography of three pages (pp. 106-108).

What is Streptococcus mastitidis? J. M. ROSELL (*Cornell Vet.*, 23 (1933), No. 2, pp. 169-176).—Following a discussion of the subject, in which reference is made to the work of Hadley and Frost (E.S.R., 69, p. 429), the author presents a table giving the most important characteristics of other nonhemolytic streptococci often cultivated from milk. He concludes that in determining the relationship between *S. mitis* and *S. agalactiae* or *S. mastitidis* insufficient comparative study has been made of other tests more appropriate than the sugars test. Experience with nearly 400 strains of streptococci isolated from milk, taken aseptically from separate udder quarters, has led the author to conclude that the other streptococci, such as *S. bovis*, *S. cremoris*, *S. lactis*, *S. fecalis*, *S. mitis*, and *S. salivarius*, are mostly of exterior origin.

An earlier account by the author and Miller has been noted (E.S.R., 69, p. 274).

A list of 44 references to the literature is included.

Nasal granuloma in cattle, G. T. CREECH and F. W. MILLER (*Vet. Med.*, 28 (1933), No. 7, pp. 279-284, figs. 4).—The authors are of the opinion that the disease here described, which occurred in a dairy herd at Jeanerette, La., and has not been previously reported from the United States, is similar to if not identical with the disease designated as nasal granuloma, which has long been known to exist in India.

Researches on the Sarcosporidia of bovines in Switzerland [trans. title], L. THÉVENOZ (*Zentbl. Bakt. [etc.]*, 1. Abt., Orig., 124 (1932), No. 7-8, pp. 458-465).—The author has found that in Switzerland an exceptionally high percentage of bovines are infected with Miescher's tubules.

The ketones of the blood and urine of the cow and ewe in health and disease, J. SAMPSON, A. C. GONZAGA, and C. E. HAYDEN (*Cornell Vet.*, 23 (1933), No. 2, pp. 184-207).—This is a preliminary report on an investigation on the

alkali reserve of the blood and the ketones of the blood and urine of the cow and ewe now under way at the New York State Veterinary College. The work has been largely restricted to a study of the effects of normal and abnormal pregnancy and the postparturient diseases upon these constituents. The results obtained tend to confirm the findings of several investigators and serve to increase knowledge of the subject of ketosis in animals.

The account is presented in connection with a list of 36 references to the literature.

Bradsot of sheep [trans. title], H. MIESSNER, A. MEYN, and G. SCHOOP (*Zentbl. Bakt. [etc.]*, 1. Abt., Orig., 120 (1931), No. 5-6, pp. 257-290, pl. 1, figs. 9).—An account of bradsot or braxy of sheep in Germany, where it is of widespread occurrence, in Norway, and elsewhere, is followed by a report of studies particularly of its etiology and control, presented in connection with a list of 33 references to the literature.

The apparent cause of an infectious enteritis of very young lambs, H. H. HELLER (*Jour. Bact.*, 25 (1933), No. 1, pp. 91, 92).—An account is given of a fatal epidemic enteritis that occurs in very young lambs in California and elsewhere, associated with lambing in sheds, and appears in widely separated fulminating outbreaks. "Diarrhea may or may not occur; death may supervene at the age of 1 or 2 days; there is severe toxemia, and there are frequently nervous symptoms. The characteristic lesions are severe hemorrhagic enteritis isolated in stretches but not in patches of the small intestine, necrosis of the intestinal epithelium, infiltration of the mesenteric lymph nodes, injection of the adrenals, congestion and atelectasis of large circumscribed portions of the lungs, and engorgement of the cerebral and other blood vessels."

The author confirms the finding previously demonstrated by J. Howarth that intestinal content and mixed cultures therefrom convey the disease to lambs by feeding.

"The tissues and blood of the lambs are frequently sterile. Filtered extracts of the intestinal content contain a powerful poison that resists boiling and is not neutralized by botulinus antitoxins of types A, B, C, and D; 0.25 cc of such extract may kill an injected mouse in 2.5 hours. Mixed cultures and their filtrates from a large series of lambs contained this poison, which on intraperitoneal injection prostrated guinea pigs and caused death by respiratory failure in a few hours. Lesions of these guinea pigs resembled those of the lambs.

"A long series of experiments in which lambs were fed treated intestinal content and cultures showed that it was highly improbable that an anaerobe causes this disease. Some of the colonies of colon bacilli from the intestine produced a poison of the identical effect as that of the intestinal extract and the mixed cultures; 4 cc of filtrate from one colony culture killed a guinea pig in 2.5 hours. The loss of pathogenicity of the colon bacillus strains was phenomenally rapid; their colony variants were numerous. . . . This enteritis differs in lesions from English 'lamb dysentery'; it resembles closely isocolon bacillosis of calves (Christiansen). It partakes of the nature of food poisoning and of infection. It would seem to be caused by the formation of a poison in the milk in the intestine of lambs, by a virulent stage of a colon bacillus that is highly variable. Death is usually due to absorbed poison; septicemia may, however, occur."

"Struck": Enteritis and peritonitis of sheep caused by a bacterial toxin derived from the alimentary canal.—Paper 2, A. D. McEWEN (*Jour. Compar. Path. and Ther.*, 46 (1933), No. 2, pp. 108-125).—This is a report of studies made during the years 1930, 1931, and 1932 (E.S.R., 65, p. 472) of a

disease occurring on the Romney Marsh commonly known as struck. The disease has been produced in sheep by the administration of small numbers of *B[acterium] paludis* enclosed in a small, 1 or 2 cc, gelatin capsule.

On the causative agents of two enzootic forms of mastitis of sheep, *Micrococcus ovis* Migula 1900 and *Bacterium ovinum* n.sp. [trans. title], H. HAUPT (*Zentbl. Bakt. [etc.]*, 1. Abt., Orig., 123 (1932), No. 5-6, pp. 365-376; abs. in *Rev. Gén. Méd. Vét.*, 42 (1933), No. 494, pp. 106, 107).—Following a review of the literature, the author reports particularly upon the results of a bacteriological study of (1) an organism first considered by M. E. Nocard in 1887,³ named by T. Kitt in 1893 as *M. mastitis gangraenosae ovis*⁴ and in 1903 as *M. mastitidis gangraenosae ovis* (E.S.R., 15, p. 405), and designated by W. Migula in 1900 as *M. ovis*,⁵ and (2) a new form here described under the name *B. ovinum*, which appears to be the organism studied by Dammann and Freese in 1907.⁶ The new form is distinct from *Hemophilus ovis* Mitchell 1925 (E.S.R., 54, p. 678) and *B. purificiens* Christiansen 1917.⁷ An organism culturally and serologically identical with *B. ovinum* was isolated by the author from a focus in the lung of a sheep.

Myiasis in sheep due to larvae of *Lucilia sericata* [trans. title], E. A. R. F. BAUDET and O. NIESCHULZ (*Tijdschr. Diergeneesk.*, 60 (1933), No. 12, pp. 648-658; *Ger., Eng., Fr. abs.*, pp. 657, 658).—After briefly discussing the development of *L. sericata* and preventive measures for its control, a detailed account is given of the experiments conducted with a view to testing the action of a number of drugs on the larvae.

Spirilla as the cause of infectious abortion in sheep [trans. title], R. BERGE and G. SCHOOP (*Deut. Tierärztl. Wehnschr.*, 41 (1933), No. 5, pp. 65-68, figs. 2).—A report is given of observations made during an outbreak of abortion due to *Spirillum fetus*, in which 193 of a flock of 368 ewes aborted. A list is given of 26 references to the literature.

Experiments in the treatment of stomach worms in sheep, F. H. S. ROBERTS (*Queensland Dept. Agr. and Stock, Div. Ent. and Plant Path. Pam.* 5 (1932), pp. 17).—In six experiments conducted, copper sulfate and mustard, carbon tetrachloride, tetrachlorethylene, sodium arsenite and copper sulfate, arsenic and magnesium sulfate, and sodium fluosilicate, respectively, were employed. The results are summarized as follows:

Under the conditions outlined, carbon tetrachloride in a 2 cc adult and 1 cc lamb dose combined with liquid paraffin to make 5 cc is considered the most successful method of treatment against *Haemonchus contortus*. Arsenic and epsom salts and copper sulfate and mustard in the doses used are also highly efficient, with little to choose between them but with the former drench perhaps the cheaper and more efficient. Tetrachlorethylene gave very disappointing results. In any case its cost as compared with that quoted for carbon tetrachloride would prohibit its use, the treatment of 1,000 sheep costing a little more than 22s. Further experiments are required with sodium arsenite and copper sulfate and with sodium fluosilicate before any definite opinion on their efficiency against *H. contortus* can be expressed.

In testing the efficiency of these materials for tapeworms, carbon tetrachloride, tetrachlorethylene, and copper sulfate and mustard appeared to have had little effect on the tapeworms in the lambs treated, every lamb yielding

³ Ann. Inst. Pasteur, 1 (1887), No. 9, pp. 417-428.

⁴ Bacterienkunde und Pathologische Mikroskopie für Thierärzte und Studierende der Thiermedizin. Wien (Vienna): Moritz Perles, 1893, 2 ed., rev. and enl., p. 321.

⁵ System der Bakterien, II. Jena: Gustav Fischer, 1900, vol. 2, p. 90.

⁶ Deut. Tierärztl. Wehnschr., 15 (1907), No. 12, pp. 165-170.

⁷ Maanedsskr. Dyrlaeger, 29 (1917), No. 17, pp. 449-458, fig. 1.

numbers of worms, many of them of fair length. Of the lambs treated with arsenic and magnesium sulfate not a tapeworm of any noticeable length was obtained. The results indicate a certain efficiency against tapeworms to be possessed by this arsenic mixture. With sodium arsenite and copper sulfate there was evidence of a slight efficiency only.

A list is given of 28 references to the literature.

Infection of the zebu with Piroplasmidae [trans. title], W. L. YAKIMOFF, N. W. NEZWETAÏEFF, E. F. RASTEGAÏEFF, and A. I. SCHMULEWITSCH (*Zentbl. Bakt. [etc.]*, 1. Abt., Orig., 124 (1932), No. 7-8, pp. 465-471, pl. 1).—In experimental work with the piroplasms affecting domestic cattle the authors found the zebu to become infected through subcutaneous as well as intravenous inoculation of *Piroplasma bigeminum*, *Gonderia mutans*, and *Anaplasma rossicum*, and also with *Babesiella bovis* through the attachment of infected larvae of the castor-bean tick.

A study of Brucella infection in swine and employes of packing-houses, I. F. HUDDLESON, H. W. JOHNSON, and E. E. HAMANN (*Jour. Amer. Vet. Med. Assoc.*, 83 (1933), No. 1, pp. 16-30).—Contributing from the Michigan Experiment Station, the authors report upon investigations conducted under the headings of (1) serological and bacteriological findings in slaughtered hogs (pp. 18-20), (2) the effect of meat preservation processes on the viability of *B. suis* in naturally infected hog tissues (pp. 21-23), and (3) the examination of employees of packing houses for evidence of *Brucella* infection and exposure to *Brucella* (pp. 23-25), and presented in connection with a list of 12 references to the literature.

In the course of the work 3,975 hogs slaughtered at two packing houses in Michigan were studied for the presence of *B. suis* infection. Of those examined by means of the whole blood rapid agglutination test, 388 showed agglutinins in their blood, and from 41 of the reacting hogs *B. suis* was recovered from one or more tissues. It was found that the maintenance of hog tissues naturally infected with *B. suis* at a temperature of -10° F. for 30 days has little, if any, effect upon the viability of the organism.

"When hog spleens naturally infected with *B. suis* are kept in meat-curing brine solution for as short a period as 5 days, it is very difficult to recover the organism by cultural methods. The organism may be recovered in small numbers in heavily infected spleens after being in brine for a period of 40 days.

"The data from the examination of 167 employees in packing houses indicate that 10.7 percent (according to the agglutination test), or 23.9 percent (according to the opsonocytophagic activity test), have been exposed to *Brucella* from the handling of infected hog tissues. The results from the re-testing of 18 employees in one packing house after the occurrence of a definite clinical case of undulant fever would indicate that when exposure to infective material takes place the exposed develop active immunity or active infection."

Splenic lesions in hog cholera, A. L. DELEZ (*Jour. Amer. Vet. Med. Assoc.*, 83 (1933), No. 1, pp. 82-90, figs. 6).—In his study at the Indiana Experiment Station the author found hemorrhagic and necrotic lesions in hog cholera spleens independent of secondary infection. Early lesions in the spleen were found to be characterized by an endothelioid cell proliferation adjacent to or surrounding the follicular arteries, with an outer zone of hemorrhage.

Human and avian types of tubercle bacilli recovered from swine, C. D. STEIN (*Jour. Amer. Vet. Med. Assoc.*, 83 (1933), No. 1, pp. 105-109).—Because of the comparative rarity in the finding of the human type of tuberculosis in

swine, the details of a case which occurred at Denver, Colo., in December 1931 are reported.

Two unusual cases of tuberculosis in hogs caused by the avian type of tubercle bacillus, A. B. CRAWFORD (*Jour. Amer. Vet. Med. Assoc.*, 83 (1933), No. 1, pp. 110, 111).—The author reports upon the detection of the avian type of the tubercle bacillus in the spleen of the retained carcass of a hog at a slaughtering establishment in Baltimore and another case in a hog spleen received from Chicago.

The biology of *Streptococcus equi* and of *S. agalactiae* [trans. title], H. HAUPT (*Zentbl. Bakt. [etc.]*, 1. Abt., Orig., 120 (1931), No. 5-6, pp. 291-304; 123 (1931), No. 3-4, pp. 240, 241).—The results of cultural studies which have led to the differentiation of these two species are reported. It is concluded that for practical purposes streptococci from cases of strangles may be identified as *S. equi* if grown on a litmus milk medium without causing any change. A list of 30 references to the literature is included.

The differentiation of *Streptococcus equi* of strangles [trans. title], GEWENIGER (*Zentbl. Bakt. [etc.]*, 1. Abt., Orig., 124 (1932), No. 3-4, pp. 236-238).—This is a discussion which supplements the account by Haupt above noted.

The helminth parasites of dogs in Marseilles, S. G. SOLOMON (*Jour. Helminthol.*, 11 (1933), No. 3, pp. 157-162).—Of 37 dogs which were given post-mortem examinations in Marseille, all except 1 were infested with intestinal cestodes and 15 with intestinal nematodes.

Coccidiosis of the hare, A. ROBERTSON (*Jour. Trop. Med. and Hyg. [London]*, 36 (1933), No. 10, pp. 143-148, figs. 24).—Two hares found to be infected showed oocysts capable of being separated into the five clearly defined groups here described.

The occurrence of blood groups in chickens, G. SCHÜTT (*Ueber das Vorkommen von Blutgruppen bei Hühnern. Inaug. Diss., Hyg. Inst. Tierärztl. Hochsch., Hannover, 1929*, pp. 79).—Following a review of earlier blood-group work, including that on blood groups in man (pp. 11-21) and of blood groups in the domesticated mammals (pp. 22-39), personal investigations of the blood of 150 fowls are reported (pp. 40-74). Isoagglutination occurs in the fowl, three blood groups being recognized. A list is given of 56 references to the literature.

Nutritional encephalomalacia in chicks: Influence of age, growth, and breed upon susceptibility, A. M. PAPPENHEIMER and M. GOETTSCH (*Jour. Expt. Med.*, 57 (1933), No. 3, pp. 365-371, fig. 1).—The authors find that "nutritional encephalomalacia may be induced in chicks up to the age of approximately two months. As the preliminary feeding period on a natural foods diet is increased, the percentage incidence of the disease becomes progressively less. The average time between institution of diet and appearance of the disease tends to diminish. There is no correlation between growth and incidence of the disease. White Leghorns, Barred Plymouth Rocks, Rhode Island Reds, and White Wyandottes are equally susceptible."

The effect of the ration upon the incidence of so-called range paralysis, H. L. WILCKE, F. D. PATTERSON, E. W. HENDERSON, and C. MURRAY (*Poultry Sci.*, 12 (1933), No. 4, pp. 226-232).—In studies conducted at the Iowa Experiment Station the feeding of 1 or 2 percent of cod-liver oil and exposure to direct sunlight, the feeding of yeast over a period of 8 months at the rate of 5 percent of the total ration, or the feeding of green feed, iodine, and various ratios and amounts of calcium and phosphorus appeared to affect the course of the disease. A diet which did not produce satisfactory growth, and which

did not sustain the life of growing birds, exerted an inhibitory effect upon the development of the disease, but the diets studied are not considered an important factor in the incidence of range paralysis.

A list is given of 22 references to the literature.

Biological studies of the tubercle bacillus, II, W. A. WINN and S. A. PETROFF (*Jour. Expt. Med.*, 57 (1933), No. 2, pp. 239-264, pls. 6, figs. 4).—This contribution deals with a new conception of the pathology of experimental avian tuberculosis, with special reference to the disease produced by dissociated variants.

A preliminary report on the study of poultry vermifuges, E. F. THOMAS (*Jour. Amer. Vet. Med. Assoc.*, 83 (1933), No. 1, pp. 61-75, figs. 4).—Experiments conducted at the Florida Experiment Station here reported indicate that hens given one worm treatment and replaced on the same ground are handicapped, since they suffer a decreased egg production due to treatment and are reinfested with ascarids and tapeworms before they have time to recover.

"The evidence secured from these experiments shows that worm treatment as practiced in Florida is apparently not only worthless but harmful and expensive. There was very little indication of any superiority of one treatment over the other. There was no correlation between the degree of ascarid infestation, as measured by evacuation due to treatment, and egg production in laying hens. It would seem, from the indications shown in these preliminary studies of the value of vermifuges, that the best procedure for poultrymen to follow would be to inaugurate sanitary measures to prevent infestation as far as possible. When infestation does occur, cull vigorously, and forget worm treatment until some vermifuge and method of use has been found; tested, and proved beneficial by the use of control flocks. Poultrymen should not put confidence and faith in testimonials regarding the value of vermifuges, as has been done in the past."

Further studies on the relative efficiency of vermifuges for poultry, W. L. BLEECKER and R. M. SMITH (*Jour. Amer. Vet. Med. Assoc.*, 83 (1933), No. 1, pp. 76-81).—The authors' studies (E.S.R., 66, p. 576; 68, pp. 677, 825) have led to the conclusion that Black Leaf 40, in doses of 0.1 to 0.3 cc, plus 15 grains of kamala, can be used safely and effectively for the removal of intestinal parasites from poultry at a very reasonable cost (2 c. per bird or less). Iodine vermicide and Pulvules No. 142 (Lilly), plus 15 grains of kamala, are of about equal efficiency, but the latter is less expensive. In heavily infested flocks, when there are many badly depressed, unthrifty birds either iodine vermicide or Pulvules No. 142 (Lilly) could be used with greater safety.

AGRICULTURAL ENGINEERING

Irrigation practice and engineering.—I, Use of irrigation water and irrigation practice, B. A. ETCHEVERRY and S. T. HARDING (*New York and London: McGraw-Hill Book Co.*, 1933, vol. 1, 2. ed., rev., pp. X+256, figs. 111).—This is the second edition, revised, of this text and handbook (E.S.R., 34, p. 481). It has been completely rewritten, but the main changes are in the examples used to illustrate the principles of farm irrigation practice. The treatment of irrigation practice is limited to the handling and use of water on the farm. Pumping from ground water is included and given special treatment.

The financial rehabilitation of irrigation and drainage districts, G. E. P. SMITH (*Arizona Sta. Bul.* 144 (1933), pp. 121-142, figs. 2).—This bulletin discusses the historical and legal aspects of irrigation in Arizona, and lists the districts with areas and indebtedness. The effects of the depression are dis-

cussed with reference to price levels, farm losses, land values, and tax delinquency, and the position of the bondholders is presented with reference to legal remedies. It is suggested that the best solution is to compromise. Steps in reorganization are presented.

A new type of installation for measuring soil and water losses from control plats, H. V. GEIB (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 7, pp. 429-440, figs. 11).—In a contribution from the U.S.D.A. Bureau of Chemistry and Soils, a detailed description is given of a type of divisor box which was found to work very satisfactorily, along with a description of the complete installation as it is now being used on the soil erosion and moisture conservation control plats at the Blackland Erosion Experiment Station at Temple, Tex.

A type of divisor box was evolved which gave practically the same aliquot at all stages of flow. The outlet or weir end of this box consisted of a number of identical rectangular slots, stamped out with a die to insure greater accuracy and uniformity. This multislot divisor box was found to be very accurate, and entirely suitable for use alone or in series to obtain a definite aliquot of the run-off from erosion control plats.

Divisor for taking aliquots of runoff, R. E. UHLAND (*Agr. Engin.*, 14 (1933), No. 7, pp. 186-188, figs. 4).—This contribution from the U.S.D.A. Bureau of Chemistry and Soils describes and illustrates a divisor flume which provides a cheap and easy method for measuring soil and water losses from larger areas than can be used where all the run-off is retained. These divisors, designed to take an accurate aliquot sample of the run-off, are made up of a series of the venturi type of flume. The run-off water flowing through the apparatus is divided at the end of each flume, representing a unit of the device as it passes over a steplike drop, so that with 5 equal divisions a $\frac{1}{32}$ (3.125 percent) aliquot of the total flow is cut out and saved in an appropriately placed tank. With 7 equal divisions the device cuts a $\frac{1}{128}$ (0.78 percent) aliquot. This equipment is being used at the soil erosion experiment station near Bethany, Mo.

Results from calibrating tests of 10 small divisor flumes and 1 large divisor flume demonstrated that it is possible to manufacture these devices so that they will duplicate one another. The presence of silt in the water did not affect the accuracy of the flume. Entering the water at either end of the concentrating trough demonstrated that the aliquot conforms to that obtained when the water is entered uniformly over the entire length of the trough. Calibration curves were secured for both the large and small divisors which give the relation between the discharge into the concentrating trough and the depth in the back part of the first venturi unit of the tandem of units.

Preliminary tests indicate that it will be possible to design divisor flumes of this type by which other than equal divisions of the run-off can be made. While it is preferable that each divisor be separately calibrated, it was found that divisors constructed by an efficient sheet-metal worker and installed, using only a level and square, gave an aliquot which varied less than 5 percent from the theoretical. By calibrating each flume and making finer adjustments, this deviation can be reduced. Since the large size divisor, which makes 7 equal divisions, performed in such close conformity with the smaller size making 5 divisions, it seems logical to conclude that the size can be safely increased by adding more venturi units.

While the problem of screening out trash is somewhat formidable, this nevertheless is being satisfactorily accomplished with a screen made of 2-mesh hardware cloth.

Evaporation from salt solutions and from oil-covered water surfaces, C. ROHWER (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 8, pp. 715-729, figs. 3).—Studies conducted by the U.S.D.A. Bureau of Agricultural Engineering in cooperation with the Colorado Experiment Station are reported.

Comparisons were made of the rate of evaporation from water in standard land evaporation pans and from similar pans covered with oil or containing various concentrations of sodium chloride and sodium sulfate. A film of transformer oil or medium engine oil reduced the evaporation, but dissipation of the film by rain, wind, and other causes rendered this an uneconomical method for reducing evaporation from large surfaces. From 2, 5, 10, and 20 percent solutions of sodium chloride the evaporation was 97, 98, 93, and 78 percent, respectively, of that from water. From 2, 5, and 10 percent solutions of sodium sulfate the evaporation was 104, 98, and 98 percent, respectively, of that from water. Evaporation from the salt solutions followed the same law as evaporation from water, correction being made in the computations for the effect of the salt upon the vapor pressure.

A proposed system of erosion control, H. D. SEXTON and E. G. DISEKER (*Agr. Engin.*, 14 (1933), No. 6, pp. 150-152, fig. 1).—The results of preliminary studies conducted at the Alabama Experiment Station on the use of strip cropping for erosion control are reported, together with studies of a method of running rows to avoid an excessive number of short rows and on the use of machinery on hillside land. Studies were conducted on the 10 erosion plats at the station.

It has been found that terraces, while necessary on all steep cultivated land to prevent gulying, alone do not sufficiently control erosion. Austrian peas or vetch used in addition will satisfactorily control erosion once they cover the ground. The losses, from a single rain, of material carrying plant nutrients may be more than that supplied by a winter cover crop if the land is left unprotected during the cultivation period. It was found that planting in strips eliminates the necessity of having all the field plowed up or loose at the same time and thus exposed to great losses of soil from summer rains. It was also found that filter cropping reduces sheet erosion between terraces very materially and is a necessary supplement to terraces. Certain leguminous crops used as filter crops were found to be satisfactory in preventing erosion. Strips of beans reduced erosion approximately 50 percent on land with a slope of 10 percent, and the effects of this filter crop were very marked as the slope increased. The data also show that the stubble and trash left after the beans were harvested were important factors in controlling erosion until a winter cover crop could be established. The moisture conservation exhibited by the bean crop strips was an additional practical feature of strip cropping, especially where a lack of moisture is an important factor in obtaining a stand of winter cover crops.

In the machinery experiments it was found that the Nichols terrace can be successfully crossed by properly designed equipment. This terrace consists of a broad shallow ditch with a slight mound on the lower side. Running the rows across terraces at an angle to the hillside reduced side slippage of the machinery. It is concluded that machinery larger than 2-hp. units must be made more flexible if it is to be successfully used on hillside land.

Public Roads, [May and June 1933] (*U.S. Dept. Agr., Public Roads*, 14 (1933), Nos. 3, pp. [2]+37-56+[2], figs. 9; 4, pp. [2]+57-72+[2], figs. 8).—These numbers of this periodical contain respectively the current status of Federal-aid road construction as of March 31 and May 31, 1933. Data on State gasoline taxes, motor vehicle registrations, and motor vehicle receipts, for

the year 1932, and the following articles: The Illinois Financial Survey (pp. 37-51, 56) and Price Indices Show Trend of Highway Construction Costs (pp. [1], 56) are also given in No. 3, while No. 4 contains an article on The Michigan Financial Survey (pp. 57-72).

The supporting strength of rigid pipe culverts, M. G. SPANGLER (*Iowa Engin. Expt. Sta. Bul. 112 (1933), pp. 100, figs. 56*).—Studies conducted in cooperation with the U.S.D.A. Bureau of Public Roads are reported.

The purpose of this research has been to determine the load factor for rigid pipe culverts when installed under various field conditions affecting the vertical reaction and the active lateral earth pressure, and subjected to vertical loads due to the covering earth, with or without loads due to surface traffic. The plan pursued was to conduct a number of experiments in which several pipe sections, selected at random from a given shipment, were tested in the laboratory with the 3-edge bearing test. A like number of similar sections were then loaded in the field by an actual embankment and the field strength determined. The ratio of these two strengths is the load factor for that set of pipe for the conditions under which they were installed in the field tests.

With the data thus secured as a basis, a rational theory for determining the load factor under all conditions of loading was developed. Working values of the load factor, determined in accordance with this theory, are proposed for a range of field conditions covering all cases likely to be encountered in practice.

It was found that the field supporting strength of rigid pipe is materially affected by the character of the bedding of the pipe. As a result of this study, four classifications of bedding conditions are proposed and defined to cover the range of conditions normally encountered in practice. From poorest to best these classifications are (1) impermissible projection bedding, (2) ordinary projection bedding, (3) first class projection bedding, and (4) concrete cradle projection bedding. The necessity for a definitely controlled field practice of bedding culvert pipe is clearly shown.

Marston's theory of loads on conduits due to earth fills, which assumes the vertical load on a conduit to be uniformly distributed over its breadth, was verified by analyses of the radial pressure on two culverts.

The conclusion that active lateral pressures about equal to those calculated by Rankine's formula may be considered to act against those portions of pipe culverts which project above the surface of the natural ground adjacent was reaffirmed. A large number of measurements of radial pressure on rigid culvert pipe were made by means of earth pressure cells of the type designed by Goldbeck and Smith. These cells were found to be of little value in making such measurements, primarily because the actual earth pressures vary widely from point to point and an impractical number of cells would be necessary to determine average pressures accurately. Stainless steel ribbons sliding between canvas surfaces were used to measure radial pressures and were found to be superior to the pressure cells. This superiority was due largely to the fact that while the cells measured pressure over a circular area of only 10 sq. in., the ribbons being 48 in. long and 0.5 in. wide gave a measure of the average pressure on 24 sq. in.

A device for measuring the vertical settlement at any point in the interior of an embankment was developed as a part of this research and is fully described. While it was operated successfully, it seems to be susceptible to further development and refinement.

Tests of anchorages for reinforcing bars, C. J. POSEY (*Iowa Univ. Studies Engin. Bul. 3 (1933), pp. 31, figs. 18*).—The object of this investigation was to

secure an anchorage giving high ultimate values of spirally reinforced hooks but without their tendency toward excessive slip.

The specimens were all made of $\frac{1}{2}$ - or $\frac{5}{8}$ -in. diameter high-carbon steel bars, cast in concrete blocks which were 9 in. square and approximately 2 ft. long. A few of the specimens were cast in blocks 6 in. wide instead of 9. The length was varied an inch or so either way when necessary to allow for differences in the height of the exposed portion of the bar. The proportion of size of bar to the size of the enclosing concrete specimen was chosen as representing closely what is common in reinforced concrete construction.

It was found that the early load-slip ratio is greater the larger the radius of hook. The larger hooks carry greater loads until a slip of 0.03 or 0.04 in. is reached. At slips greater than this, the smaller hooks carry greater loads than do the larger hooks. In this range the large hooks lose load as the slip increases, while the small hooks pick up more load. Variability of results increases as the radius of bend increases, being greatest with the straight embedments. None of the hooks (or straight bar) with embedment of 22 diameters total length furnished a satisfactory anchorage in the concrete used. There was too great a variability and the strength was insufficient.

The most satisfactory anchorage tested during the 4 years of investigation was a straight embedment of plain round bar, the surface of which had been roughened by rows of indentations made with a blunt cold chisel. A length of embedment of only 22 times the diameter of the bar consistently developed a bar stress of 20 times the ultimate compressive stress of the concrete, with a slip of less than 0.01 in. at the loaded end. These bars were superior to ordinary commercial deformed bars, both in ability to pick up load with little slip and in ultimate carrying capacity. The essential difference between the roughened bars of these tests and ordinary deformed bars is in the size and frequency of the deformations, those on the commercial bars giving too high a bearing stress on the sides of the ridges in comparison with the shearing stress in the concrete between the ridges.

Corrosion of metals in salt solutions and seawater, G. D. BENGOUGH (*Jour. Soc. Chem. Indus., Chem. and Indus.*, 52 (1933), Nos. 10, pp. 195-210, figs. 22; 11, pp. 228-239, pls. 4, figs. 18).—Studies on the measurement of corrosion are reported, which were confined to stagnant salt solutions.

It is pointed out that the most important or controlling factor is that one which permits the slowest rate of corrosion. A machined surface is considered preferable to one emieried or polished because of the ease, rapidity, and uniformity of production, particularly at the edges, and because it is believed to be less contaminated and more reproducible. It is useful to adopt a constant surface area for specimens.

It has been found that increased cross section of the vessel containing the solution increases the corrosion rate with both zinc and steel. Typical corrosion-time data for zinc and mild steel are presented graphically, together with data on the distribution of corrosion on both metals. With steel it was found that the starting points of corrosion were sporadically distributed and very numerous. There was usually a cessation of corrosion, after an hour or two, at a very large number of the points, but persistence at others which seemed to be fairly sporadically distributed. The cessation appeared to be due to suppression of the less active points by films formed by alkali resulting from action at the most active.

A process of aggregation began after a few hours which resulted in the formation of a few large attacked and unattacked areas. These were continued around the discs from one surface to another, owing to the creeping of alkali.

The configuration of the corroded areas was decided early in the process in dilute solutions, and spreading thereafter was very slow, probably owing to the formation of impervious walls between the attacked and protected areas, which hindered interaction of corrosion products close to the metal surface. Spreading increased with concentration.

Penetration was deeper in dilute solutions for periods up to about one year. The depth of penetration was usually found to be greater on the bottom surfaces of steel, and especially deep at or near the position of the glass points which supported the specimen.

Studies of factors which control distribution of corrosion showed that it is governed on both steel and zinc by at least four factors, namely: (1) The distribution of films of corrosion products possessing protective properties which might be either long continued (with steel) or ephemeral (with zinc); (2) the tendency of alkali to creep away from its principal seat of formation (at and near the water line) down into the interior of the liquid, and so cause protection there; (3) the special reactivity of edges at which corrosion started and then spread inward at varying rates—spreading could take place toward either more, equally, or less aerated parts of the metal; and (4) the tendency of heavy metallic salt to fall and so to neutralize alkali and cause corrosion to spread downward from a given starting point.

Laboratory and field tests of concrete exposed to the action of sulphate waters, D. G. MILLER and P. W. MANSON (*U.S. Dept. Agr., Tech. Bul. 358 (1933), pp. 80, pls. 9, figs. 22*).—This is a progress report of experiments conducted in cooperation with the Minnesota Experiment Station and the Department of Conservation of the State of Minnesota. It gives results of observations on the behavior of experimental specimens subjected to the action of artificial sulfate solutions in the laboratory and the behavior of specimens installed under natural field exposure conditions in Minnesota, North Dakota, and South Dakota. For this work more than fifty thousand 2 by 4 in. cement-concrete and cement-mortar cylinders, 1,000 cement-mortar briquets, 3,000 specially made concrete drain tile, and numerous miscellaneous specimens, have been made.

The results indicate that the severity of action on concrete of pure solutions of either magnesium or sodium sulfate increases with the strength of solution but at a diminishing rate for strengths greater than 1 percent. The destructive action of magnesium sulfate does not differ greatly from that of sodium sulfate in solutions of equal strength, although the latter averaged slightly more severe with most of the 35 portland cements used in these tests. The 28-day strength is a fair index of resistance for concrete of any given cement and given curing conditions, but may have no significance for comparing concretes made of cements from different mills or when the concretes are cured under widely different conditions.

Under identical exposure conditions, concrete made of a highly resistant portland cement may last 10 times as long as that made of a cement of low resistance. Neither standard physical tests nor ordinary chemical analyses give any indication of the resistance of a cement to sulfate action. Qualities of the raw material associated with the geological formations from which it comes may be factors in the resistance of a cement.

Resistance of concrete is markedly increased by curing in water vapor at temperatures of from 212° to 350° F., almost to the point of immunity to action for the most favorable temperatures and curing periods. Resistance is not increased, however, by raising the curing temperatures until 212° is reached, except in connection with the use of certain admixtures.

The admixtures ironite, cal, calcium chloride, blast-furnace slag, trass, moler, and possibly volcanic ash have appreciably retarded sulfate action on concrete cured at room temperatures. Results were outstanding, however, only as the relatively high curing temperatures of 100° and 155° were used in conjunction with ironite, and 155° with cal and calcium chloride. Under these conditions, cylinders had the highly satisfactory values of from 82 to 94 percent of normal strengths after 5 years in Medicine Lake, S.Dak.

Special cements other than alumina cements have not shown a degree of resistance that would justify preference over the more resistant of the portland cements, except possibly an imported mason's cement containing 33½ percent diatomaceous silica (moler) mixed with the cement clinker before grinding.

Each of the three alumina cements tested resisted sulfate action to a degree that approached the ideal, but displayed definite indications of instability when used in concretes and mortars stored for long periods in tap water at room temperatures.

A routine test of the resistance of a cement to sulfate action is suggested. This consists in storing one half of each of the 3 briquets used in the standard 7-day tensile test in a 5 percent solution of sodium sulfate and the companion half in a 5 percent solution of magnesium sulfate. To make these 5 percent solutions, on the basis of anhydrous salts, requires 3 oz. of room-dry salt per gallon of water. Not more than 15 briquet halves should be stored in each gallon of solution, which should be renewed completely every 4 weeks. It is desirable that the temperature of the solutions be maintained as near 70° as practicable. Earthenware jars covered to reduce evaporation are satisfactory and convenient containers.

Briquets made of highly resistant cements and stored under the conditions prescribed will show little or no visible action in either solution in less than 16 weeks, excepting perhaps a slight rounding of the edges. Briquets made of cements very low in resistance, when subjected to this test, will have almost completely disintegrated in 16 weeks. The value of the test will be greatly increased if briquets made of cement from several mills are included in order to give a basis for directly comparing behavior. If this is done, the failure of any cement falling well below the average will be more convincing.

The feasibility of speeding up this 16-week test by increasing the strength of the solution, by keeping the solution at higher temperatures, by using leaner mixes, and in numerous other ways, has been tried without satisfactorily consistent results.

The conclusion is drawn that only cements that are above the average in resistance should be considered for use where sulfates are known to be present. With any given cement and any predetermined conditions of curing, care should be observed in all particulars to obtain the highest practicable 28-day strength.

Concrete should be kept from intimate contact with sulfates until it has had opportunity to dry and harden in air for the longest time practicable. Depending on the particular cement used, air hardening may greatly increase resistance. As a precautionary measure, this hardening should be continued for 30 days if possible, and 90 days or longer is desirable. To develop the highest resistance in draintile, sewer pipe, and other products of concrete, they should be steam cured when from 12 to 24 hours old at temperatures of 212° or higher for 48 hours or longer.

Alumina cement may be used advantageously for concrete structures subject to extremely severe conditions of sulfate exposure if the concrete will be continuously moist at temperatures generally below 60° and rarely exceeding 70°. These moisture and temperature conditions are about the average for draintile after installation.

Leaching tests on water-soluble wood preservatives, C. GREAVES (*Canada Dept. Int., Forest Serv. Circ. 36 (1933), pp. 15, fig. 1*).—The results of four series of leaching tests with zinc chloride compared with sodium fluoride, crude oil followed by zinc chloride, copper sulfate followed by potassium ferrocyanide, and dinitrophenol are reported.

It was found that if the results for zinc chloride are based on the chlorine determinations, zinc chloride and sodium fluoride when present in wood in the concentrations generally used in practice are very similar as regards their resistance to the leaching action of water, neither of them being very efficient. From determinations of both zinc and chlorine on the same pieces of wood, it is evident that the chlorine of zinc chloride is not as resistant to leaching as the zinc. The amount leached out of 3.65-in. cubes was considerably greater than that for 4-in. cubes. A preliminary treatment of seasoned wood with crude oil before the usual treatment with zinc chloride was very effective in decreasing the amount of zinc chloride leached out. The amounts of preservative leached from 2-in. cubes cut from the centers of 4-in. cubes were small and indicate that the formation of insoluble copper ferrocyanide in the surface layers of wood is effective in decreasing the amount of copper sulfate leached out. Dinitrophenol appears to be quite resistant to leaching. The amounts lost by the cubes treated with dinitrophenol were approximately the same whether the leachings were continuous or intermittent.

Power and machinery in agriculture, W. M. HURST and L. M. CHURCH (*U.S. Dept. Agr., Misc. Pub. 157 (1933), pp. 39, figs. 17*).—This publication summarizes data from various sources on the changes effected by power and machinery, kinds of power and its geographic distribution, amount and cost of power, and major developments in farm tractors. The data show that nearly 17,000,000,000 hp.-hr. are developed annually on farms in the United States, and that animals furnish approximately 50 percent of this power.

A simple method of approximating the duty of a tractor or horse-drawn implement is expressed by the equation

$$D = \frac{SW5,280(100-P)10}{43,560 \times 100}$$

in which D is duty in acres per day, S speed in miles per hour, W effective width in feet, 5,280 number of feet per mile, P percent of time lost in turning and in servicing, 10 number of hours worked per day, and 43,560 number of square feet per acre.

An appendix presents statistics relating to tractors, horses and mules, and certain farm conveniences.

Light and power on farms, W. H. JONES (*Aberystwyth: Univ. Col. Wales, Dept. Agr. Econ., 1932, pp. 22*).—This reports the results of a survey of the use and cost of electricity on certain farms in Wales, special attention being devoted to three typical farms. Data also are included on wiring costs, costs of electrical equipment, soil heating, and use of electricity in poultry farming.

The various forms of energy used in agriculture near Bologna and the possibility of agricultural electrification [trans. title] (*Ingegnere, 7 (1933), No. 3, pp. 185-193, figs. 7*).—A survey of the agricultural utilization of power in the vicinity of Bologna, Italy, indicates that in round figures this amounts to 74,000 hp. as used on some 173,000 acres of arable land which might be electrified. The annual cost of power used on this land is about 50 lire (\$2.63) per acre. It is estimated that the power operations involved might be done electrically for one fourth of this cost.

An analysis of the present available power indicates that it includes about 40,000 hp. in animals, about 19,400 in tractors, and about 3.030 in electrical

equipment. Statistical and economic data on the adaptation of electricity are summarized.

Industrial, agricultural, and domestic applications of electricity, including illumination and tariffs, R. B. MATTHEWS (*Jour. Inst. Elect. Engin.* [London], 72 (1933), No. 434, pp. 132-140).—This report includes among other things a discussion of recent applications of electricity to agriculture, such as for lighting of homes and poultry houses, heating, meeting general power requirements, operation of liquid manure pumps, milking machines, and barn machinery and hay drying.

What electricity costs in the home and on the farm, edited by M. L. COOKE (*New York: New Republic*, 1933, pp. XXI+231+[43], pls. 2, figs. 3).—This is a symposium on the cost of distribution of electricity to domestic and rural consumers, presented before the Institute of Public Engineering in New York City, January 20, 1933. Among the papers were *The Physical Characteristics of the Distribution Plant*, by W. E. Herring (pp. 6-12); *The General Problem of Cost Allocation*, by J. M. Clark (pp. 13-23); *The Development of Industrial Cost Keeping*, by N. M. Perris (pp. 24-36); *Service Elements and Costs for Distributing Electricity to Retail Customers*, by H. W. Reed (pp. 37-52); *Distribution Cost of Electric Energy with Special Reference to Residence and Rural Customer*, by C. W. Pike (pp. 75-102); *The Relation of Local Costs to System Costs in the Production and Distribution of Electric Energy*, by R. Husselman (pp. 118-144); *On the Variations in Distribution Costs per Customer as Between Companies*, by G. E. Goldthwaite (pp. 145-153); *The Problem of Distribution Costs as the Designing Engineer Sees It*, by R. E. McDonnell (pp. 158-169); *The Effect of Cost of Electricity on Use*, by J. D. Ross (pp. 195-223); and *Distribution Substation Costs*, by O. M. Rau (pp. 224-231).

Lightning protection of distribution systems and transformers, C. S. SPRAGUE and C. F. HARDING (*Purdue Univ., Engin. Expt. Sta. Res. Ser.* 42 (1932), pp. 89, figs. 38).—This bulletin presents the results of a 4-year experimental investigation of the effect of potentials, simulating those of lightning, upon 2300-4000 to 115-230-v electric light and power distribution systems. In general the work was centered upon the secondary distribution system, the distribution transformer, and the consumer's wiring circuit, as lightning damage commonly manifests itself at these points.

The major part of the investigation has been performed upon several spans of outdoor distribution line built especially for the project. This line was constructed in accordance with the specifications frequently used in practice for 4-wire, grounded Y, 2300-4000-v primaries on the upper arm and with 3-phase, 230-v power secondaries and single-phase, 115-230-v, 3-wire lighting secondaries on the lower arm. The majority of the results obtained are not, however, necessarily restricted to this one type of construction.

Accounts of a few surge tests upon transformers of other manufacturers than those of the original project are also included.

The value of an experimental wood pole distribution line with an insulated artificial cloud charged by means of a surge generator was definitely established for lightning protective investigations involving induced as well as direct stroke potentials. The practicability and economy of studying, by means of such laboratory equipment, the operation of various transformer, lightning arrester, and ground connections, when exposed to surges approximating those of lightning, were demonstrated.

Efficient primary protection upon an overhead distribution system affords a considerable degree of protection to secondaries located below the primaries. A well-grounded secondary neutral wire acts to reduce potentials to ground on

adjacent wires. With existing transformer design, the insulation of the secondary winding may be considerably overstressed by steep wave front surges without excessive stress on the primary insulation. Such secondary stresses may be relieved by improvements in secondary insulation. Low ground resistances, although desirable in other respects, do not necessarily reduce the initial potentials which may be induced upon the system. A noninductive load in the consumer's premises reduced the potentials from 60 to 70 percent at the service entrance.

Tests involving both induced voltages and direct strokes have demonstrated that the interconnection of the primary lightning arrester ground with the grounded secondary neutral effects a considerable reduction in the maximum voltages which may exist across the transformer and imposes no extra hazard upon the consumer's wiring.

From the few tests made on old and dirt-covered transformers, it appears that if the interconnection is used even these transformers are reasonably immune to lightning voltages. Surge flash-over of secondary racks or service arm brackets should be very rare, since this requires about 100 kv, or approximately 10 times the limiting value of key sockets, switches, etc. The extra capacitance of twisted service cable, as compared with the open-wire service, caused only a slight reduction in the voltages at the service entrance.

The recent surge-proof type distribution transformers provide improvements in bushing design and lead clearances. In some cases, however, there is a possibility of poor coordination between bushing flash-over values and coil insulation puncture values. Reduction of the surge impedance of arrester ground leads is best accomplished by the use of a second ground wire down the opposite side of the pole. The tests of the insulation strength of transformers, when exposed to very high surge potentials without the protective features of coordinating gaps, bushing flash-over, or lightning arrester installation, illustrate the importance of maintaining a high ratio of insulation puncture potential to maximum protective potential.

Fuel oils: Commercial Standard CS12-33 (*Washington: U.S. Bur. Standards, 1933, 2. ed., pp. II+13, fig. 1*).—The text of specifications covering six grades of fuel oil for various types of fuel-oil-burning equipment is presented.

Performance tests of alcohol-gasoline fuel blends, R. B. GRAY (*Agr. Engin., 14 (1933), No. 7, p. 185*).—Field and laboratory tests with tractors and trucks to compare the performance characteristics of alcohol-gasoline blends with those of straight gasoline are briefly summarized. The tests were conducted by the U.S.D.A. Bureau of Agricultural Engineering in cooperation with the U.S. Navy Department Annapolis Engineering Experiment Station.

Octane ratings obtained on each of three gasolines alone averaged 66.6, and when mixed with 10, 20, and 30 percent absolute alcohol gave an average of 74, 79.6, and 84.6, respectively. Tests on a National Advisory Council for Aeronautics engine, running at 1,200 r.p.m., gave a highest useful compression ratio of 5.6 and a maximum horsepower of 26 hp. on a 10 percent blend, and a highest useful compression ratio of 6.5 and a maximum horsepower of 27.2 hp. on the 20 percent blend.

Road tests of a 0.5-, 1.5-, and 3.5-ton truck over a 20-mile course on paved highways gave the following results: The unloaded 0.5-ton truck, driven at an average speed of 36 miles per hour, ranged from 16.67 miles per gallon on plain gasoline to 15.92 on a 20 percent blend. The 1.5-ton truck with a load of 3,380 lb. and driven at an average speed of 26.5 miles per hour ranged from 12.73 miles per gallon on plain gasoline to 12.62 on a 20 percent blend. The 3.5-ton truck with a 7,700-lb. load and driven at a governed speed of approximately

14.2 miles per hour ranged from 5.43 miles per gallon on plain gasoline to 5.85 on a 20 percent blend. Performance tests of two 0.5-ton trucks showed more carbon deposition in the engine burning gasoline.

Belt tests of a standard 4-cylinder tractor showed a maximum of 31.8 hp. on plain gasoline, 31.6 hp. on the 10 percent blend, and very little difference in fuel economy. When plowing, this tractor working under practically the same conditions with both fuels showed a fuel economy slightly in favor of the blend. Belt tests of this same tractor, but fitted with high-altitude pistons, gave a maximum horsepower of about 30 hp., further loading being accompanied by severe detonation. By using a 10 percent blend the power was increased to 35 hp., with 20 percent to 43.8 hp., and with 30 percent to 44.4 hp. The fuel economy with the 20 percent blend was better than on plain gasoline. A 2-cylinder, horizontal tractor engine on the belt delivered a maximum power of 31.7 hp. on straight gasoline and 32.2 hp. on the 10 percent blend, with a fuel consumption approximately the same. When plowing, this tractor working under practically the same conditions with both fuels showed a fuel economy slightly in favor of gasoline.

Power alcohol, compiled by D. W. GRAF (*U.S. Dept. Agr., Bur. Agr. Engin.*, 1933, pp. 29).—This is a bibliography of references on the use of alcohol as motor fuel and for related purposes.

Oxidation of some hydrocarbons [trans. title], Mlle ESTRADÈRE (*Compt. Rend. Acad. Sci. [Paris]*, 196 (1933), No. 10, pp. 674–676, fig. 1).—Studies are reported on the oxidation of hexane, cyclohexane, and cyclohexene under constant pressure and under conditions conducive to detonation. Mixtures of the hydrocarbons with oxygen (4:1) at atmospheric pressure were subjected to temperatures of from 300° to 600° C.

It was found that the phase of active oxidation began at the point where the oxygen decreased rapidly in the gas at temperatures of 330°, 340°, and 410°, respectively, for hexane, cyclohexane, and cyclohexene. There was a simultaneous appearance of carbon monoxide in important quantities. Peroxides were produced only at temperature intervals of from 10° to 15°, the maximum yields being at 330°, 340°, and 410°. At these temperatures quantities of carbon dioxide and aldehydes were also produced. The cyclization of saturated hydrocarbons does not appear greatly to increase their resistance to oxidation.

Effect of tetraethyllead on octane number, L. E. HEBL, T. B. RENDEL, and F. L. GARTON (*Indus. and Engin. Chem.*, 25 (1933), No. 2, pp. 187–191, figs. 9).—An empirical analysis is made of the relationship between the concentration of tetraethyl lead and the octane number of a gasoline, and a definition is developed for the lead susceptibility of any gasoline.

It is shown that the octane number of an ethylized gasoline is determined by a combination of five distinct factors whose proper relationships are incorporated in an ethyl blending chart. These are (1) the effectiveness of iso-octane at different concentrations in raising the antiknock value of iso-octane-heptane mixtures, i.e., the relative dimensions of octane numbers in different parts of the scale; (2) the effectiveness of tetraethyl lead at different concentrations (this compound is most effective in small concentrations, and, as more is added to a gasoline, its effect gradually diminishes); (3) the octane number of the base gasoline before tetraethyl lead is added; (4) the lead susceptibility of the gasoline; and (5) the number of cubic centimeters of tetraethyl lead added per gallon of gasoline.

This chart may be used for determining the lead susceptibility of a gasoline from the octane numbers of two blends containing different concentrations of tetraethyl lead. Lead susceptibilities of gasolines made from various crudes

and by several processes are given. It is emphasized that the equations on which the ethyl blending chart is derived are of an empirical nature and as such are open to error in certain specific cases. However, the chart has been checked on more than two hundred base gasolines of widely divergent types, and so far only one type of exception has been noted. It has been found in this connection that the lead susceptibility of a gasoline is not determined by the hydrocarbons alone, but may also be markedly affected by small amounts of impurities either found in the gasoline or formed on treatment.

Results of recent farm tractor fuel studies, C. G. KRIEGER (*Agr. Engin.*, 14 (1933), No. 7, p. 177).—The results of tests of four makes of tractor engines are briefly summarized, the object of which was to obtain fundamental data regarding the over-all operating efficiency of these engines, with special regard to the thermal efficiency and the volumetric efficiency under actual operating conditions. Each of these engines was operated on several different grades of fuel, ranging from the lower grade distillates up through the grades of gasoline. In each case the optimum compression ratio and the proper fuel induction system were employed for the particular fuel which was being tested.

By changing the accessories of the stock engines to give maximum efficiency on the better grades of gasoline possessing high antiknock value there was an average increase of 27 percent in brake horsepower, an average increase of 24 percent in torque, and an average improvement of 26 percent in fuel economy.

The conclusion is drawn that with the present type of design, which permits operation on either low-grade fuels or on gasoline, the efficiency of present-day tractor engines is far below that of present-day automotive engines. All the tests which have been run indicate that when gasoline is used instead of low-grade fuels the life of the lubricating oil is increased from two to three times, and the life of the valves in tractor engines was materially increased when gasoline was used instead of kerosene. Preliminary studies on various bores and strokes for an engine of a certain output indicated that the size of the present tractor engines and the size of the cooling system could be materially reduced if the engines were designed to run on gasoline.

Experiments with valves, valve materials, and valve seats indicated that the use of proper valve-seat inserts in connection with proper types of valves (assuming the valves are made of good material) would eliminate most of the valve trouble which exists at the present time.

Recent findings in tractor engine lubrication, E. A. HARDY (*Sci. Agr.*, 13 (1933), No. 6, pp. 395-402).—The results of investigations on tractor engine lubrication, conducted at the University of Saskatchewan, are briefly summarized.

It has been found that oils used in internal-combustion engines can be reclaimed and used again. The method of reclaiming may vary from straining the oils through cotton cloth, blotting paper, or felt strainers to the use of filters consisting of layers of soil and sand, or leaving the oil in barrels for long periods of time so that the heavy particles will settle to the bottom. The function of reclaiming the oil is to remove the dirt and water from the oils. No attempt is being made to remove the dilution caused by heavy fuel ends accumulating in the oil.

The lightest oils which may be operated in the engine without excessive oil pumping should be used. The oil should be strained each day and used over again and new oil be added to the crank case to maintain the proper level, where the engine is not equipped with an oil filter. A portion of the used oil should be mixed with the fuel for use during at least the first 20 minutes of operation. Great saving in engine operation can be effected where excessive wear is eliminated, and the operating efficiency of the engine is increased,

"Dunlop" pneumatic tyres, wheels, and hubs for farm carts ([*Gt. Brit.*]) *Min. Agr. and Fisheries, Agr. Mach. Testing Com. Certif. and Rpt. 46 (1933), pp. 7, pl. 1, fig. 1*).—Tests conducted by the Institute for Research in Agricultural Engineering of the University of Oxford are reported.

For a 2-wheeled farm cart using the ordinary iron-tired wheels and wheels fitted with pneumatic rubber tires, the use of the pneumatic rubber-tired wheels was found to reduce the draft from 13 to 41 percent, according to load carried and type of land traversed. The increase in pay load that could be carried varied from 35 to 108 percent, according to ground conditions. The ground was less cut up by the pneumatic tires than by the iron tires.

A study of mechanical corn pickers, C. K. SHEDD (*Agr. Engin., 14 (1933), No. 5, pp. 123-125, fig. 1*).—Studies conducted by the U.S.D.A. Bureau of Agricultural Engineering in cooperation with the Iowa Experiment Station are reported. The most important fact developed by these tests was the high rate of field losses of all machines tested. Out of 40 separate tests made in 1931 and the early part of 1932, there were only 3 in which the field losses were less than 10 percent of the yield. The lowest record was 8.31 percent and the highest 54.1. In nearly all of the tests the losses were between 10 and 20 percent of the yield.

The field losses of shelled corn increased in 1932 over 1931 so that they just about offset the reduced loss of whole ears. These losses are taken to indicate a serious shortcoming of machines. As now designed, they have established a definite but limited place for themselves in corn production. It is not expected that corn pickers will come into general use until they are perfected so that field losses will be no greater than with hand picking.

It was found that the basic design of corn pickers with reference to location and gathering points, gathering chains, and snapping rolls is practically the same for all makes of pickers now on the market.

The effect of corn plant characteristics on mechanical corn picker loss, R. H. WILEMAN (*Agr. Engin., 14 (1933), No. 5, pp. 125, 126, figs. 2*).—The results of studies conducted at the Indiana Experiment Station are briefly reported.

Certain characteristics of the corn plant seem to have a direct relationship to and materially affect the corn losses when harvested with a mechanical corn picker. These same characteristics show a direct bearing on the corn yield, those giving a low mechanical picker loss resulting in a higher yielding corn. The ear shank diameter and the percentage of down stalks are the characteristics having the greatest effect upon the mechanical corn picker loss and also upon the yield. There is also a close relationship between the ear shank diameter and the percentage of down stalks. The ear shank diameter is considered the most important corn plant characteristic affecting mechanical corn picker loss.

Field curing of hay as influenced by plant physiological reactions.—II, The role of leaves in the dehydration of hay plants, T. N. JONES and L. O. PALMER (*Agr. Engin., 14 (1933), No. 6, pp. 156-158, figs. 17*).—This is the second contribution on the subject from the Mississippi Experiment Station (*E.S.R., 68, p. 390*).

It has been found that leaves of plants are natural agencies for the disposal of plant moisture and that they aid in the removal of moisture from the stems while curing. The nearly impervious stem wall of Johnson grass seems to allow very little radial evaporation of moisture except through the node. The type of stem possessed by monocotyledons seems to respond more favorably to the process of mechanical crushing. The stomata on alfalfa leaves remain open longer when the hay is windrowed than when allowed to stay in the swath.

New developments in hay driers, A. W. CLYDE (*Agr. Engin.*, 14 (1933), No. 5, pp. 127-129, figs. 2).—The results of studies conducted at the Pennsylvania Experiment Station are briefly reported. The studies were limited to two types of hay driers, including the low-temperature conveyor type and the high-temperature rotary-drum type. There seemed to be no great difference between the thermal efficiencies of the two different types of driers. The slightly lower thermal efficiency shown for the conveyor type was corrected by insulation or reduction of air leakage. It is thought probable that the choice between the two should be governed by features other than efficiency in the use of the fuel.

It is also considered probable that progress in reducing the losses in exhaust gases will be rather slow unless these gases can be used to preheat the green hay. There is still opportunity to reduce the cost of drying by reducing the losses of heat. While no single loss is very great, in the aggregate the main savings may be secured by drying more tons per year, increasing the automatic operation, and greater use of natural drying or wilting. The large saving of fuel which can be made by the last method makes it apparently the easiest way to reduce the cost.

Power, labor, and fuel requirements of artificial driers, H. T. BARR (*Agr. Engin.*, 14 (1933), No. 5, pp. 131, 132).—This is a brief contribution from the Louisiana Experiment Stations in which data are presented on power, labor, and fuel requirements of artificial hay driers, particularly the type developed at the station.

The power requirement on the Louisiana drier is divided as follows: Ensilage cutter 10, burner fan 5, revolving drum 2, elevating fan 5, exhaust fan 2, conveyor screw 1, and oil pump 1 hp. The results obtained with a 2-stage drier suggest a more efficient use of the hot exhaust gases by utilizing them for preheating the green forage.

Costs of storing chopped and whole hay, F. H. HAMLIN and F. J. BULLOCK (*Agr. Engin.*, 14 (1933), No. 6, pp. 147-149, figs. 2).—This paper presents the results of a study made on 100 farms where the chopper method of storing has been in use for one or more years. The object was to determine the comparative cost of storing chopped and whole hay under ordinary farm conditions.

Twenty-two States were represented in the study. The amount of hay chopped per year ranged from 8 to 410 tons, the average being 106. Thus both large and small scale operators were represented. The kinds of hay chopped included all common legume, grass, cereal, and mixed hays. The machines used for chopping included eighty 15-in. machines and twenty 19-in. machines and were essentially heavily built blower-type choppers equipped with hay-feeding mechanisms.

Results showed that for storing whole hay there is required a team and other equipment worth \$80, useful only for handling hay, whereas for chopping and storing chopped hay there is required a tractor and other equipment worth \$365, normally used 42 percent on hay and 58 percent on other crops. An average crew of 5.25 men was required for whole hay and 4.25 men for chopped hay. A crew of 4 men handled 3 tons of whole hay per hour, while 2 men handled 4 tons of chopped hay per hour. The average cost of the storing operation only was about 50 c. per ton by either method.

The conclusion is that chopping will show a money saving over not chopping and presents the great advantage of more rapid handling. Chopped hay also has less than one half of the bulk of whole hay and lends itself to machine conveyance from a separate hay storage.

Preservative treatments for silo walls, F. C. FENTON (*Agr. Engin.*, 14 (1933), No. 6, pp. 153, 154).—The results of tests of preservative treatments for

silo walls conducted at the Kansas Experiment Station are briefly presented. Six silos were used, and the wall surfaces were divided vertically into 6 or 8 parts and a different material placed on each strip. Materials included portland cement washes, portland cement wash with iron filings, tar coatings, concrete hardener, sodium silicate, concrete paint, aluminum foil, synthetic resin, and liquid rubber. No conclusions are drawn.

Silo wall protective coatings, G. F. STEIGERWALT (*Agr. Engin.*, 14 (1933), No. 6, pp. 154, 155, figs. 2).—Results of a series of laboratory tests of the value of different materials as protective coatings for silo walls are briefly presented. Materials which offer possibilities as coatings were found to be portland cement plus iron filings containing sal ammoniac; coal tars when applied on rough surfaces; emulsified asphalts plus either portland cement or solutions of synthetic resin; synthetic resin either clear or mixed with rubber, portland cement, or emulsified asphalts; and stonite.

Investigation of apple storages, C. I. GUNNESS (*Massachusetts Sta. Bul.* 293 (1933), pp. 7, 8).—The progress results are briefly summarized of investigations on the effect of humidity on evaporation from apples in storage.

Use of aluminum in dairy equipment, H. A. TREBLER (*Internatl. Assoc. Milk Dealers, Proc.*, 25 (1932), Plant Sect., pp. 46–87, figs. 14).—This study dealt with the physiological, chemical, physical, and mechanical properties of aluminum when used for dairy equipment.

The conclusion is drawn that aluminum appears to be the cheapest and best material at present available for transportation and storage of milk. Its substitution for present materials will permit from 20 to 50 percent saving in cost and weight. Aluminum foil insulation compares favorably with cork, both in cost and insulating properties, and will make possible a very important saving in weight for transportation tanks and insulated truck bodies. Aluminum can further be used in practically every place where tinned copper or tinned iron are now being used, and it is claimed will be found cheaper and in general much more satisfactory if certain precautions are taken. It will prove satisfactory in dairy equipment if (1) contact with other metals is avoided in the liquid and heavy contamination with other metals is avoided in the system previous to the aluminum equipment, (2) silicate is added to cleaners and sterilizers and chromate to brines, and (3) paper or rubber gaskets are used in connection with aluminum couplings and the couplings tightened by hand only.

The sensitiveness to electrolysis is the chief disadvantage of aluminum. The chief advantages of the metal are nontoxicity, insolubility in dairy products, light weight, low cost, and good workability.

The purification of waste waters from beet sugar factories, E. H. RICHARDS and D. W. CUTLER ([*Gt. Brit.*] *Dept. Sci. and Indus. Res., Water Pollut. Res., Tech. Paper 3* (1933), pp. X+157, figs. 15).—An account is given of an investigation on the treatment of waste waters from beet sugar factories conducted over a period of 3 years at the Rothamsted Experimental Station and at a commercial beet sugar factory.

An introductory statement describes the process of the manufacture of beet sugar, with particulars regarding the amount and character of the waste waters produced at each stage. The first part of the report describes laboratory experiments to determine the effects of such factors as rate of filtration, strength of the liquor supplied to the filters, preliminary dilution of diffusion and pulp-press waters with filter effluent, size and nature of filtering material, depth of filter, addition of nitrogen in various forms, and preliminary fermentation to convert part of the sucrose into organic acids.

It was found that diffusion and pulp-press water varies considerably in composition, not only as produced at different factories but also from time to

time at the same factory. An average waste water of this type contains from 0.1 to 0.2 percent sucrose and takes up from 100 to 200 parts of dissolved oxygen per 100,000 in 5 days.

Fermentation with periodic additions of lime did not effect any high degree of purification as measured by the test for dissolved oxygen taken up in 5 days, although it caused a large reduction (over 80 percent) in the figure for oxygen absorbed from permangante. In the laboratory experiments on this process, the figure for dissolved oxygen taken up by the treated liquid was not reduced by more than 35 percent of that for the original waste water.

In the laboratory experiments on the bio-aeration process, an activated sludge was prepared from sewage works sludge and was used for the treatment of an aqueous extract of beet containing 0.1 percent sucrose. As measured by the test for dissolved oxygen taken up in 5 days, a high degree of purification (over 90 percent) was achieved in 3 experiments.

Preliminary experiments on the treatment of diffusion and pulp-press water and solutions of similar composition by the process of biological oxidation on percolating filters demonstrated that a high degree of purification (over 90 percent) can be effected by this process.

The conditions necessary to achieve 90 percent purification of diffusion and pulp-press water by biological oxidation on percolating filters of a depth of about 6 ft. are: (1) The waste water should be subjected to sedimentation to remove the major portion of suspended solid matter and diluted to give a liquid equivalent in strength to a solution containing about 0.1 percent sucrose. The dilution may be effected by river water, effluent from the filters, or transport and washing water. (2) The diluted waste water should be filtered at a rate not exceeding 100 or 150 gal. per cubic yard of filtering material per day. (3) The most suitable medium for the filters is a hard insoluble material such as gravel, flint, or slag. The material should be graded to a size of about 0.375 to 1 in. and should be free from dust.

A study was also conducted of the biological population of the experimental filters. Estimations of the volume and composition of the film and of its sugar-fermenting power were made, and the numbers of organisms of different groups were counted.

A greater volume of film occurred on the finer filter media, and in all cases the film increased during the first 4 or 5 weeks and then remained fairly constant in amount unless sloughing was caused by some external agency. The volume of film decreased gradually with the depth of the filter.

The organisms present included bacteria, fungi, yeasts, algae, protozoa, rotifers, nematodes, insect larvae, and oligochetes. There was little difference between the populations of the different filters. The smaller organisms reached their full development after 2 or 3 weeks, while the larger ones developed more slowly.

The numbers of organisms decreased on the whole with the depth of the filters except in one or two cases, e.g., testaceous rhizopods and paramecia species, which were more common at the bottom. The protozoa present were largely meso-saprobic forms, and were similar in type to those occurring in sewage filters and in soil. Among the bacteria present in the film there was an appreciable number of nitrogen-fixing organisms.

Inoculation with medium from a sewage works percolating filter made no apparent difference in the purification of the effluent nor in the population developed in the filters, except for the introduction of insect larvae at an earlier stage than occurred in the uninoculated filters.

As far as was observed, a rate of flow up to 300-gal. yard days did not wash organisms out of the filters.

Studies of *Bacterium coli* in privately owned rural water supplies, R. L. FRANCE (*Jour. Bact.*, 25 (1933), No. 6, pp. 623-635).—This study, reported by the Massachusetts Experiment Station, was undertaken to investigate the adequacy of the routine procedure of the standard methods of water analysis for bacteriological examination of water when applied to privately owned rural water supplies.

When 223 strains of the colon-aerogenes group isolated from water and 178 strains isolated from feces were studied, all strains were confirmed as *B. coli* by the Standard Methods procedure. When the methyl red, Voges-Proskauer, sodium citrate, and uric acid tests were employed to differentiate the strains studied into *B. coli* of fecal type and nonfecal *B. aerogenes*, it was observed that a considerably greater percentage of the strains from water than of the strains from feces gave irregular results. The percentage of strains identified by the differential media as *B. coli* of fecal type was considerably greater among the strains isolated from feces than among those isolated from water. The methyl red and Voges-Proskauer tests agreed perfectly with each other for all strains tested. The sodium citrate and uric acid tests failed to agree with each other in 15 of the strains (6.7 percent of the total) isolated from water, but with only one strain isolated from feces. A considerably greater number of strains isolated from water were identified as *B. coli* of fecal type by the methyl red and Voges-Proskauer tests than by the sodium citrate and uric acid tests considered separately or together.

The results obtained in this investigation suggest that dependence on the Standard Methods procedure alone for determining the sanitary quality of drinking water, especially from privately owned supplies of unknown history, results in too many of the samples being condemned. The need of supplementary differential tests is indicated, but results do not justify the recommendation of any particular test or group of tests.

Septic tanks and privies [trans. title], I. COULPIER (*Jour. Agr. Prat.*, 97 (1933), No. 19, pp. 381-384, figs. 4).—Brief practical information is given on the construction of sanitary privies and septic tank sewage disposal systems for country use in France.

AGRICULTURAL ECONOMICS

Agriculture and the world crisis, L. H. BEAN (*U.S. Dept. Agr. Yearbook* 1933, pp. 91-95, fig. 1).—This article discusses the relation of the depression to agriculture as a whole. Articles noted elsewhere "examine the effects of the depression on various branches of agriculture, report new discoveries relative to different crops and classes of livestock, and suggest methods that help farmers reduce costs of production."

[Investigations in agricultural economics at the Maryland Station, 1931-32] (*Maryland Sta. Rpt. 1932*, pp. VIII-X).—Brief reports are included showing for investigations not previously noted (1) the factors contributing to low unit costs on 279 Piedmont Plateau and 265 Eastern Shore farms, (2) the percentage of farm expenses of the farms studied in the same areas going for fire insurance premiums, and (3) the total membership and the value of products marketed, supplies purchased, and products transported by 42 cooperative associations in 1931.

[Investigations in agricultural economics and farm management at the Massachusetts Station, 1931-32] (*Massachusetts Sta. Bul.* 293 (1933), pp. 5, 6, 7, 34, 35, 36).—Results of investigations not previously noted are reported on as follows:

The effect of changes in Snyder's index of price level and receipts of eggs on the prices of nearby and western eggs in the Boston market, and the daily milk consumption during April 1928, 1930, and 1932 in Worcester, by A. H. Lindsey; the changing methods in the wholesale distribution of perishables, by L. P. Jefferson; the relationships between prices, supply, and seasonal variation in local demand for vegetables, by H. B. Rowe; the effect of replanning equipment on labor requirements on dairy farms, by R. L. Mighell; the relationship of acreage of silage corn, soil, and types of machinery used to cost of silage production, by C. I. Gunness, J. A. Foord, and J. E. Thigpen; labor requirements in loading silage on wagons in common use and low-rack wagons and in harvesting and packing operations for vegetables with common and new systems, by Mighell and R. H. Barrett; and the use of loose pens for cows as affecting the amount of labor, equipment, and cost for bedding, by Foord.

Current Farm Economics, Oklahoma, [June 1933] (*Oklahoma Sta., Cur. Farm Econ.*, 6 (1933), No. 3, pp. 53-84, figs. 3).—Included are an article on the new Federal agricultural organization, by H. Morgenthau, Jr.; discussions of the price-fixing provisions of the Federal farm relief act of June 12, 1933, by J. T. Sanders, of the emergency farm mortgage provisions, by L. S. Ellis, and of the provisions for raising the general price level, by P. H. Stephens; an article by G. S. Wehrwein on possible tax reduction through consolidation of counties; discussions of the findings of investigations of the grade, staple length, and tenderability of Oklahoma cotton, 1928-32, by C. C. McWhorter, of the receipts of hogs at the Oklahoma City market, 1923-32, by R. A. Ballinger, and of farm home conveniences and power equipment in Oklahoma, by E. Miller; brief discussions of the general agricultural situation in the State, by Ellis, and of the cattle and hog situations, by P. Nelson; and a table showing the indexes, 1910-32 and March, April, and May 1932 and 1933, of farm prices in the United States and Oklahoma, prices paid by farmers of the United States, wholesale prices in the United States, Oklahoma corn-hog ratio, and Oklahoma demand deposits (1910-22 and May 1933 not included).

[Papers presented at the conference of the British Agricultural Economics Society] (*Jour. Proc. Agr. Econ. Soc.*, 2 (1933), No. 3, pp. 143-238, pl. 1).—Included are the following papers and discussions thereon presented at the meeting held at Oxford, England, June 24-27, 1932: Some Economic Problems of the Strawberry Industry, by E. Thomas (pp. 156-167); Technical Improvement in Agriculture as a Cause of General Depression, by J. E. Meade (pp. 168-181); The Study of Prices in Agricultural Economics Research, by K. A. H. Murray (pp. 182-196); The Relations Between Producers' and Consumers' Co-operative Societies in England and Wales, by G. Walworth (pp. 197-210); and Recent Rural Changes as They Affect the Younger Generation, by M. K. Ashby (pp. 227-236).

Short statements by various European and Canadian visitors on the economic situation of agriculture in their respective countries are also included.

Agricultural regions of North America.—Part XI, The Columbia Plateau wheat region, O. E. BAKER (*Econ. Geogr.*, 9 (1933), No. 2, pp. 167-197, figs. 17).—This is the eleventh article in the series previously noted (*E.S.R.*, 66, p. 881).

State land-settlement problems and policies in the United States, W. A. HARTMAN (*U.S. Dept. Agr., Tech. Bul.* 357 (1933), pp. 88, figs. 10).—A study was made of the policies, problems, and programs of the Federal and State governments with a view of assisting in the formulation of rural-planning programs by State and county officials and others interested in solving the problems of land settlement. The area, classes and ownership of undeveloped lands in the United States, the demand for land for agricultural purposes, and the past and

present land-settlement policies and activities of the Federal Government and of the various States are discussed.

Size of farm observed through the law of decreasing returns, T. ISHIGAME (*Jour. Dept. Agr., Kyushu Imp. Univ.*, 3 (1933), No. 8, pp. 179-250, pls. 8, figs. 54).—The author discusses the methodology employed, the properties of decreasing return curves, and proper combinations of production elements.

The conclusion is drawn that "the size of farm observed through the law of decreasing returns will make the economists give up the common idea that the combinations of the production elements having the different kinds of units can be compared through their costs only, and make the investigators' full technical records in this line indispensable to solve the problems on the proper combinations of the production elements not only in agriculture but in all sorts of production industries."

The uses of efficiency factors in analysis of farm records, J. A. HOPKINS, JR. (*Iowa Sta. Res. Bul.* 160 (1933), pp. 121-176, figs. 25).—"It is the purpose of this study to attempt an appraisal of some of the principal efficiency factors in use or available from the simpler forms of farm records. It is desired to discover as accurately as the nature of the data permits the relationships which exist between these factors and net farm income and farm profit as well as concomitant variations in other efficiency factors or in related phases of the farm business." It is based on data from 2,053 business records kept on Iowa farms during the years 1927-30. Of the 1,301 records for 1929 and 1930, 29 percent were for hog farms, 8 for commercial feeders, 4 for cattle-raising farms, 17 for dairy farms, 12 for cash grain farms, and 30 percent for general-purpose farms. The factors studied were net farm income, net farm income after interest payments, management return, gross income per \$100 invested, percentage total expense to total income, percentage investment in working capital, total acres in farm, acres in corn, yield of corn per acre, value of crops per acre, number of litters of spring and fall pigs, hog income per sow, number of steers fed, beef income per head, dairy income per cow, livestock income per \$100 of feed, months of labor used, crop acres per man, and livestock per man.

The actual net income figures correlated with the estimates gave coefficients of +0.88 for 1929 and +0.82 for 1930, and the standard error of estimate was 43 percent as great as the standard deviation in 1929 and 54 percent as great in 1930. On the 144 farms on which records were kept continuously from 1927 to 1929, inclusive, the coefficient was +0.92 and the standard deviation was reduced by 62 percent. The correlation of actual and estimated net income after interest payments yielded coefficients for the four years, 1927-30, of +0.85, +0.83, +0.90, and +0.87, respectively, and the reductions in the standard deviations amounted to 46, 44, 57, and 51 percent, respectively. The correlation coefficients between actual and estimated management returns varied from +0.80 to +0.84, and the reduction in the standard deviations was between 40 and 42 percent. The study indicated that the factors studied accounted for about 50 percent of the variation in net income and about 40 percent of that in the management return.

An illustration is included of how the relationships found in the study may be used in comparing an individual farm with other farms or averages of a group of farms and in measuring the progress on an individual farm from year to year.

The farm business and the farm home (*U.S. Dept. Agr. Yearbook*, 1933, pp. 369-397, figs. 3).—Farmers Resourceful and Prompt in Making Needed Readjustments, by C. L. Holmes and V. N. Valgren (pp. 369-384), describes some of

the readjustments evident on individual farms during the depression in adjusting the program of production and costs of production, maintaining the farm plant with a minimum of cash outlay, increasing farm efficiency, and modifying financial management.

Readjustments in Family Living Are as Drastic as Those Effected in Farming, by H. Kneeland and H. K. Stiebeling (pp. 385-397), describes some of the adjustments made in reducing cash costs of farm family living for foods, clothing, and other items, in budgeting family expenses, and in increasing contributions of the rural homemakers to the cash income of the family.

Some aspects of rural land tax delinquency in Missouri, C. H. HAMMAR (*Jour. Land and Pub. Util. Econ.*, 9 (1933), No. 2, pp. 172-181, figs. 3).—Tax delinquencies have drawn public attention in Missouri, as elsewhere, in recent years. Johnson County is cited, in which delinquencies amounting to only 1 percent in 1919 had risen to approximately 9 percent in 1931.

Among causes cited are the depression, the growth of taxes, unequal assessments, bank failures, lump-sum tax collection, and inactive collectors.

A national program with State programs as parts is suggested. In Missouri the necessary State legislation has not been enacted. In the meantime, government economy, such as the elimination of unnecessary roads, school districts, county offices, and consolidation of counties, is proposed.

Farmers' response to price: A selected bibliography, compiled by O. V. WELLS (*U.S.Dept.Agr., Bur. Agr. Econ.*, 1933, pp. 26).—This is an annotated bibliography including 76 references.

Farmers' response to price in hog production and marketing, O. V. WELLS (*U.S.Dept.Agr., Tech. Bul.* 359 (1933), pp. 56, figs. 24).—The reasons for the fluctuations in hog supplies and prices, for the changes in United States hog supplies, market receipts, and State and area marketings are analyzed and discussed. Analysis is also made of the responses of individual hog producers to price situations, and means of adjusting production to demand are discussed.

Tables and charts are included and discussed showing the relation between corn-hog ratios and hog marketings, 1907-31; central market and farm hog prices, 1914-31; hog supplies and hog prices, 1919-30; industrial pay rolls and hog prices, 1919-30; Corn Belt corn-hog ratio and year-to-year changes in total federally inspected hog slaughter, 1919-30; corn-hog ratio and year-to-year changes in the number of hogs on farms, January 1, 1920-32; average dressed weight of hogs slaughtered under Federal inspection, 1919-32, to bushels of corn per hog in the Corn Belt, May to October Corn Belt corn-hog ratio, and percentage of United States hogs in the Corn Belt; seasonal distribution, 1919-30, of federally inspected hog slaughter and May to October Corn Belt corn-hog ratio and bushels of corn per hog in the Corn Belt; Chicago corn-hog ratio and year-to-year changes in Chicago hog receipts, 1919-30; corn-hog ratio and year-to-year changes in hog marketings at East St. Louis, Kansas City, and St. Joseph; season-to-season changes in hog marketings in each of six Corn Belt States and the State farm-price corn-hog ratios, 1921-30; hog production and corn-hog ratio in western and eastern Corn Belts; Minnesota and Wisconsin hog marketings, 1920-30, and butter production; California barley-hog ratio and year-to-year changes in number of hogs on farms on January 1 in the Pacific States, 1921-32; corn acreage and number of hogs on January 1 in the Cotton Belt; commercial hog slaughter and a 2-year average corn supply, 1880-1930; United States corn production and corn yields, 1907-31; and tonnage of livestock marketed per year and gross returns to producers.

Other charts show the relation between changes in prices for hogs from Monday to Tuesday and truck receipts from Tuesday to Wednesday at Sioux City, Iowa, 1929-30, and between changes in prices from Saturday to Monday and market receipts from Monday to Thursday at Chicago, 1929-30; changes in the number of sows that farrowed in the spring and in the fall in the years 1923-31; and the distribution of 236,532 Corn Belt sows farrowed in the spring of 1926 in brood-sow herds of different sizes.

It was found that hog production changes in response to the corn-and-hog price situation the same year and in the preceding year. Average weight of hogs marketed is largely determined by the corn supply per hog in the Corn Belt at the beginning of the marketing year, the corn-hog ratio during the preceding summer period, and the percentage of concentration of hogs in the Corn Belt. The distribution of marketings between the winter and summer marketing seasons is closely associated with the corn supply per hog in the Corn Belt at the beginning of the marketing year and the corn-hog ratio during the preceding summer period. Short-time changes in marketing are largely in response to short-time price changes. Hog production response during the last decade has been made to the corn-hog ratio in the Corn Belt, this ratio modified by the skim milk situation in the dairy section, more nearly to the barley-hog ratio than the corn-hog ratio on the Pacific coast, and directly in relation to the acreage of corn and indirectly to the price of cotton in the South.

Production by individual growers is influenced by weather, personal preferences, disease, and economic influences, with the latter dominant only when a large amount of individuals are considered. Since the supply of corn is largely responsible for changes in hog production and yield is the chief factor in the year-to-year changes in such supply, the variation in hog production due to corn supply cannot well be controlled. A short-time increase in hog production has tended to decrease returns to the collective mass of producers. A decrease in production has tended to increase total returns.

Variations in corn prices within Iowa, T. W. SCHULTZ (*Iowa Sta., 1933, pp. [1]+25, figs. 5*).—This is a mimeographed preliminary report of a study covering the period from October 1920 to September 1931, inclusive, in which the State was divided into 12 districts.

Prices were found to increase from the northwestern part of the State to the east and south, the differentials being small until the eastern tier of districts and the southern district of the second tier from the Mississippi River were reached. During six years—years of a large and well distributed crop with yields in eastern Iowa as large or larger than in western Iowa and of low corn prices—the average prices in the surplus districts—the four northwestern—averaged only 4 c. a bushel lower than those in the four partially deficit districts in the eastern and southeastern part of the State. In the other five years—years of comparatively low yields in eastern Iowa and with corn prices above normal—the average spread was 11 c. per bushel. For the entire period prices were more nearly the same in November. The spread widened from November until April, when the differentials averaged twice as wide as in November. They then narrowed to August and widened again in September and October.

Oklahoma farm prices, L. S. ELLIS (*Oklahoma Sta., Cur. Farm Econ., Sup., [1933], pp. 94, figs. 3*).—Tables show, by months, the Oklahoma farm prices and indexes of such prices, January 1910 to April 1933, inclusive, and the indexes of farm purchasing power, January 1910 to December 1932, inclusive, for different grains, lint cotton, cottonseed, apples, potatoes, sweetpotatoes, hay, all

crops (no prices), cattle, calves, sheep, lambs, hogs, butter, butterfat, chickens, eggs, wool, and horses. The indexes of prices of farm purchasing power are also shown for all grains, cotton and cottonseed, meat animals, dairy products, poultry products, all livestock, and all commodities in Oklahoma, and of prices paid by farmers of the United States for commodities used in living and production. Other tables show, by years 1929-31 and average 1924-28, the gross and cash farm incomes from different commodities in Oklahoma.

Charts are also included and discussed showing for 1910-32 the indexes of Oklahoma farm price of cotton, prices paid by farmers in the United States for commodities used in living and production, and the purchasing power of cotton in Oklahoma, prices received by Oklahoma farmers (22 commodities) and by United States farmers, and the purchasing power of Oklahoma and of United States farm products.

Agricultural price-supporting measures in Latin America, M. LYNKY (*Bul. Pan Amer. Union*, 67 (1933), No. 7, pp. 567-590).—This article, which is based largely on the publication by Edminster et al. previously noted (*E.S.R.*, 68, p. 406), describes the measures taken by Brazil, Cuba, Uruguay, Argentina, Mexico, and Chile.

Economic and legal aspects of compulsory proration in agricultural marketing, E. A. STOKDYK (*California Sta.*, 1933, pp. [2]+28).—This is a preliminary report of a study made "to appraise the desirability and feasibility of compulsory proration programs as a means of increasing returns to the producers of some California agricultural commodities."

The proposals for proration, the legal status in agricultural marketing, and the problems of administration of compulsory prorate programs are discussed, and the attempts made to increase returns from California lemons, oranges, grapes, lettuce, cantaloups, apples, and canned peaches through voluntary prorate programs are described.

Motor truck marketing of Michigan livestock, G. N. MORRIS (*Michigan Sta. Spec. Bul.* 235 (1933), pp. 28, figs. 7).—The growth and present scale of motor truck movements of livestock in the State, the place farmers, shipping associations, dealers, and truckers occupy in such transportation, the methods of operation of livestock truckers, and the advantages and disadvantages of motor truck transportation to each of the marketing groups are discussed. Suggested changes in marketing by truck are analyzed, and recommendations are made. The study is based on data received between June 1932 and March 1933 from 141 livestock farmers, 93 cooperative shipping associations, 31 dealers, 100 livestock truckers, 4 commission firms at Detroit, the Detroit Stockyards Company, 12 string butchers, 24 packers, county agents, railroad agricultural agents, and members of the staff of the station.

Livestock receipts at the Detroit stockyards by motor truck increased from 3.9 percent of the total receipts in 1920 to 43.7 percent in 1929 and 73.2 percent in 1932. Of the truck receipts, approximately 15 percent are hauled by producers, 35 percent by dealer truckers, and 50 percent by hired truckers. Of the total tonnage trucked for hire, 84.1 percent was handled for producers, 11 percent for dealers, 4 percent for cooperative associations, and 0.9 percent for string butchers and packers in their home communities. The length of haul varied from 20 to 400 miles, averaging 110 miles. Only occasional return loads of merchandise were secured by truckers. Considering all livestock, the shrinkage by truck was less than by rail on hauls of 50 to 100 miles and greater for hauls over 150 miles. Total marketing costs by truck were greater by 12 percent for cattle, 23 percent for calves, 8 percent for hogs, and 29 percent for sheep than rail costs, including the cost of a pick-up service.

The advantages of truck transportation include more convenient shipping intervals, the convenience of having the livestock picked up at the farm, and less time in transit. The disadvantages, in addition to the greater cost, include reduction in the volume shipped by many associations, a less uniformly reliable transportation agency, the facilitation of direct purchasing by terminal packers insofar as it lowers terminal market prices, and the difficulty of estimating the next day's receipts at the stockyards.

Some of the most desired changes in rail transportation are lower car-lot and less than car-lot rates, more flexible service on less than car-lot shipments, and faster schedules. Some of the most desired changes in truck transportation are better enforcement of the State fee on trucks used for hire, lower and more uniform rates, the availability of trucks for pick-up service and short hauls only, and more reliable truckers with better equipment.

Sources of market milk and butterfat in Ohio, C. G. McBRIDE and T. K. COWDEN (*Ohio Sta. Bul.* 523 (1933), pp. 38, figs. 5).—This bulletin reports the findings (1) in a survey of the sources of milk and butterfat purchased by milk distributors and manufacturers of dairy products in the major markets of Ohio in 1931, and (2) of an analysis of Federal census data relative to milk and cream production in the State.

In the analysis of the data regarding sources of milk and butterfat, the State was divided into eight areas of pronounced concentration of population around cities. Tables are given showing the number of farms, by counties, under inspection by the boards of health inspection of Cleveland, Cincinnati, Columbus, Akron, Dayton and Springfield, Toledo, and Canton, Massillon, and Alliance, Ohio, and Pittsburgh, Pa., and the ratio of population served by milk dealers to the number of farms under board of health inspection in the eight areas. Maps show the location of the uninspected farms selling milk to manufacturing plants in northern Ohio and the Swiss cheese area of the State. Other tables and maps show the distribution of farms on the basis of methods of assembling of sour cream or butterfat, the location of cream stations, and the predominating type of market outlets, by areas.

This survey showed a great reduction from 1903 in the number of creameries and cheese factories in the State, the entire elimination of the skimming station, and the establishment of an extensive system of milk and cream trucking. The population per farm under city milk inspection varied from 74.7 to 131 in the areas studied, the variation being due chiefly to the amount of inspected milk going into uses other than fresh consumption and the difference in the size of farms. The number of Swiss cheese factories in 1931 was less than 30, as compared with 92 reported in a survey of the State in 1903. Of the farms selling sour cream, 53,647 sold to cream stations, 16,232 sold direct to the manufacturers, and from 16,830 cream was gathered on truck routes.

The Federal census data for 1910, 1920, 1925, and 1930 were analyzed to determine for different crop and livestock reporting areas of the State the changes in the number of cows and heifers kept for milk and the effects of changes in total population and its distribution upon the demand for milk for fluid consumption. Tables show, by counties, the amount of whole milk and of butterfat sold per farm, the rural and milk-purchasing population in 1930, the population of cities over 10,000 in 1900, 1910, 1920, and 1930, and the relation of whole milk sold to the local requirements of the milk-purchasing population. This analysis showed that significant changes in the number of milk cows occurred between 1920 and 1930. The heaviest losses in numbers occurred near large centers of population, while increases took place in adjacent districts. Sales of milk per farm were highest in the counties supplying Cleveland, fol-

lowed by those selling to cheese factories. Farms selling butterfat ranked lowest. On the basis of three-fourths pound per day per capita, the whole milk sales in 64 counties exceeded the local demands, and those in 24 did not meet the demands.

Corn in world commerce: Statistical monograph (*Le Maïs dans le commerce mondial: Monographie statistique*. Roma: Inst. Internatl. Agr., 1932, pp. VII+142, figs. 23).—In 11 sets of tables, statistics are presented showing production, exports, imports, and consumption of Indian corn by the principal producing and consuming countries.

The final table presents monthly and annual prices for Argentine corn at Buenos Aires and at Liverpool-London, and for Rumanian corn at Braila and at Hamburg; and the relative influence of ocean rates in the price of corn in these markets.

Survey of the wheat situation, December 1932 to April 1933, M. K. BENNETT and H. C. FARNSWORTH (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 9 (1933), No. 8, pp. [1]+275-304, figs. 6*).—During the period surveyed, wheat futures in terms of gold were remarkably stable. After mid-March, Chicago prices rose sharply on the poor outlook for winter wheat in the United States and later on the gold embargo and prospects for inflationary legislation. Failure of foreign markets to respond to bullish developments here reflected continued bearishness of the wheat statistical position. World stocks on April 1 were some 350,000,000 bu. above normal, though visible supplies were lower. European countries imported relatively little wheat in the August-April period. Ex-European takings were large. World shipments were the second smallest in a decade.

The organization of the industry and distribution of canned tomatoes in the United States, L. M. KOVAL'SKAIA (*Organizatsiia Proizvodstva i Sbyta Tomat-Konservov v Sssh. Moskva (Moscow): Snabtekhizdat, 1932, pp. 132, figs. 30*).—The author discusses the methods of production, types of canning factories, investment, cost, geographic distribution of the industry, marketing, export, and other items in connection with the canning of tomatoes in the United States.

The Michigan pear industry, its status and trends, H. P. GASTON (*Michigan Sta. Spec. Bul. 232 (1933), pp. 35, figs. 17*).—Tables and charts are included and discussed showing the production of pears in the United States and Michigan, 1919-31; the trends in production since 1912 in the United States, Michigan, New York, Washington, Oregon, and California; the distribution of Michigan pear trees and production of pears, by varieties; the prices received by Michigan growers; the effects on returns to Michigan growers of variety and grade; the weekly car-lot shipments, June 7 to December 26, 1931, from Michigan, California, Oregon, Washington, and New York; the primary destination in 1930 of car-lot shipments of Michigan pears; and the average percentage, 1930 and 1931, that Michigan pears were of total unloads during the Michigan shipping season in seven important markets for Michigan pears. The market demands as to quality, appearance, varieties, grade, etc., of pears, how nearly Michigan is meeting these demands, and how the demand for Michigan pears can be increased are discussed.

Pear production in the United States has more than doubled since 1912, but the trend in Michigan has been slightly downward. The increased United States production has caused a downward trend in Michigan pear prices. During the height of the Michigan pear shipping season (late August to October 15) the State furnished only from 15 to 25 percent of the pears unloaded in the nearest and best markets. The Michigan growers are handi-

capped by their inability to supply a uniform pack in large volume. Standardization and large scale merchandizing are the outstanding needs of the industry in Michigan and can be accomplished best, it is believed, through cooperative effort. It is recommended that under present conditions, the additional plantings in the State should be made only by growers who can afford to sell at prices prevailing in 1930-32.

Agricultural statistics (*U.S.Dept.Agr. Yearbook 1933*, pp. 399-776).—This section is prepared under the direction of the statistical committee of the Bureau of Agricultural Economics. It is reduced from that in previous years (*E.S.R.*, 68, p. 120) by the omission of many tables and a reduction of the number of years covered in many series, but includes the most important agricultural statistics for the United States and the world so far as the agriculture of the United States is concerned. Statistics for different grains, cotton, sugar, tobacco, different fruits and vegetables, miscellaneous crops, different kinds of livestock, dairy and poultry products, foreign trade in agricultural products, farm business, and miscellaneous items, including meteorological data, are given. Historical and geographical series are also given.

Crops and Markets, [June 1933] (*U.S.Dept.Agr., Crops and Markets*, 10 (1933), No. 6, pp. 193-232, figs. 3).—Included, besides the tables, reports, charts, summaries, etc., of the usual types, are tables with a brief discussion showing for 1932 for corn, wheat, oats, and cotton the acreage, production, average yield, gross cost per acre by items, credit per acre, and net costs per bushel for the grains and per pound for cotton. The figures are by groups of States and the United States for the grains and by States and regions for cotton.

Special report on revised estimates of United States cotton acreage and yield, 1866-1931 (*U.S.Dept.Agr., Bur. Agr. Econ., Crop Rptg. Bd., 1933*, pp. [39]).—Tables show, by years, the acreage harvested, yield per acre, and total production 1866-1931, the acreage planted 1909-31, and the ginnings reported by the U.S. Bureau of the Census 1899-1931 in the United States, the several cotton-producing States, and Lower California. The statistics cover only the period 1879-1931 for Virginia and Missouri, 1894-1931 for Oklahoma, 1922-31 for New Mexico, 1917-31 for Arizona, 1910-31 for California, and 1913-31 with no data regarding ginnings for Lower California.

RURAL SOCIOLOGY

Population trends in Michigan, J. F. THADEN (*Michigan Sta. Spec. Bul.* 236 (1933), pp. 38, figs. 5).—The population of Michigan, 175,025 in 1837 when admitted as a State, reached the 1,000,000 mark in 1866, 2,000,000 by 1888, 3,000,000 by 1913, 4,000,000 by 1925, and 4,842,325 by 1930. The especially rapid growth about the time of the Civil War was associated with the development of the farming and lumbering industries; and that of the past two decades, with the automobile manufacturing industry.

Recent immigration restrictions and rapidly declining natural increases are tending to slow up the population growth materially. Population is distributed unequally over the State, and this inequality is constantly becoming greater. Thirty-four out of 39 counties having less than 30 people per square mile declined in population during the past decade, while only 1 out of 13 counties having over 100 people per square mile declined.

Population density is closely related to soil fertility and suitability for agriculture. Fifteen counties having 60 percent or more of first-class land have over four times as many total people and rural people, and over seven

times as many farm people per square mile, as the 17 counties with less than 4 percent of such land.

Counties having a total population density under 27, a rural population density under 17, or a farm population density under 10 per square mile, comprising about one third of the counties of the State, are viewed as likely to continue declining in population.

Rural social organization in Washington County, Arkansas, T. C. McCORMICK (*Arkansas Sta. Bul.* 285 (1933), pp. 43, fig. 1).—Good roads, automobiles, and other improvements have contributed to the break-down of rural neighborhoods and the transfer of their social organizations and activities to villages and cities. The purpose of the study reported was to determine the extent of this tendency in selected farming localities in Arkansas.

The study reported represents a cross section of the sample population of Washington County, amounting to about 20 percent of the total, for the year ended in the spring of 1932. Because of long continued selective urban migration, an abnormally large proportion of the people were in the older-age groups and the better educated had left the farms.

The main kinds of activities engaged in by the 333 families studied were economic, social, religious, journalistic, educational, recreational, and health. Only one fourth of these activities was attached to open-country neighborhoods, and the remaining three fourths centered in hamlets, villages, and a city which had a population of 7,394 in 1930.

The families traveled the greatest distances for recreation, health, and economic services and the least distances for religious, social, and educational activities.

Two outstanding characteristics of the area observed by the author were a lack of organization in all fields and in most types of activity, but especially in religion and education there was an excessive number of small units which were weak, expensive, and, technically viewed, inefficient. The remedy suggested is further consolidation of social institutions in the villages, a movement already begun in the case of schools. In the case of economic units, the further growth of the larger and the decline of the smaller trade centers promises to be a natural consequence of good roads and automobiles.

Though the study was made during the depression, the author found no reason to believe that the main findings would have been materially different had the inquiry been made at another time.

Scales for measuring the standard of living, E. G. TOUGH and E. L. KIRKPATRICK (*Jour. Amer. Statis. Assoc.*, 28 (1933), No. 181, pp. 55-63).—Three sets of scales used for comparing the cost of family living—the adult male equivalent, the ammain (adult male maintenance), and the cost consumption unit—are considered from the standpoints of their development, applicability, and adequacy as means of measurement.

From the standpoints of labor involved in the calculations, the adult equivalent and the ammain were the more feasible, while, from the standpoint of qualitative analysis, the cost consumption unit seemed the more desirable.

Simple correlations between expenditure per adult male equivalent, expenditure per ammain, and the sum of expenditures per cost consumption unit indicate the three to be closely related, but when each is correlated separately with total cost of living and net cash family incomes as dependent variables, the three scales appear less consistent. The correlations are higher for the cost consumption unit equivalent than for the adult male equivalent or the ammain.

The investigator should familiarize himself with the characteristics of the

various units of comparison before deciding which to use. In his choice he should be governed by the degree of exactness desired.

Insurance of farm families, I. H. GROSS and M. R. BOSWORTH (*Michigan Sta. Tech. Bul.* 133 (1933), pp. 39, figs. 2).—This study of insurance attitudes and practices of farm families was made in the Lansing area in Ingham County in 1931. It is based on random samples amounting to 100 tenant and 100 owner families.

Fifty-two owner families had life insurance averaging \$3,085, while 47 tenant families averaged \$2,646. Owner's premiums on life insurance averaged \$78.76 and tenant's \$77.39.

The fire protection of owners carrying fire insurance averaged \$5,914, of tenants \$2,467. Premiums on property insurance averaged for owners \$33.84, for tenants \$14.23.

There was no apparent relationship between income and life insurance. Insurance practices appeared to be related to valuation of farm. The younger owners carried more insurance than the older, while in the case of tenants the older operators had the higher insurance.

Education of the operator was associated with life insurance. The family pattern also exerted a strong influence, for two thirds of the families followed the example of the preceding generation in carrying or not carrying life insurance.

The carrying of property insurance was a more stable practice than the carrying of personal insurance, for five times as many personal as property insurance policies had been allowed to lapse.

Economic protection provided by insurance appeared inadequate. Because of ownership of less property, the tenant family had greater need for protection, yet it had less protection than the owner family.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Proceedings of the forty-sixth annual convention of the Association of Land-Grant Colleges and Universities, edited by C. A. McCUE (*Assoc. Land-Grant Colls. and Univs. Proc.*, 46 (1932), pp. 512, fig. 1).—This is the usual report of the convention (E.S.R., 67, p. 472) held at Washington, D.C., November 14–16, 1932, and previously discussed (E.S.R., 68, pp. 1, 141). Included are the papers and discussions thereon presented at the general sessions of the association and in the general sessions and subsections on resident teaching, experiment station work, and extension work of the section on agriculture, and the sections on engineering and home economics. The reports of standing, special, joint, and research committees, lists of officers and committees, minutes of the executive body, the constitution of the association, etc., are also included.

Agricultural part-time schools, J. H. PEARSON (*Fed. Bd. Vocat. Ed. Bul.* 108, rev. (1933), pp. VII+21).—This revision of the bulletin previously noted (E.S.R., 55, p. 788) "is a result of studies and investigations of part-time schools, and, therefore, contains information based on trends in this type of instruction which are of importance in the further development of the program." The objectives of part-time instruction, the organizing of the part-time school, methods of teaching, qualifications of teachers, content of the agricultural instruction, related instruction, and directed or supervised practice are discussed, and the minimum requirements for part-time schools are summarized.

FOODS—HUMAN NUTRITION

The microbiology of foods, F. W. TANNER (*Champaign, Ill.: Twin City Ptg. Co.*, 1932, pp. VIII+768, figs. 6).—This volume presents methods of micro-

biological analysis of all types of foods, with sufficient discussion, based on the literature of the subject, to show their origin and development. In addition to chapters dealing with the individual foods and food products there are chapters on food preservation, bacteriology of water and sewage, canning, intestinal bacteriology, bacteria (in which a few procedures of special significance in food bacteriology are presented), bacteriological examination of air, yeasts and molds, and culture media. Numerous references to original literature are given as footnotes, and many of the chapters have general bibliographies as well.

Applied chemistry.—II, Foods, C. K. TINKLER and H. MASTERS (*London: Crosby Lockwood & Son, 1932, vol. 2, 2. ed., rev., pp. XI+284, pls. 3, figs. 20*).—A revision of the volume noted previously (E.S.R., 55, p. 188).

Report of the nutrition laboratory of the home economics division, C. D. MILLER and R. C. ROBBINS (*Hawaii Sta. Rpt. 1932, pp. 18-21*).—This progress report (E.S.R., 67, p. 473) contains further data on the content of vitamins A and B in raw and bran-salted Chinese cabbage, vitamins A and D in various organs of the shellfish opihi (*Helcioniscus exerata*; *H. argentatus*), and vitamin B in rice bran bread. Other vitamin studies reported include a comparison of the content of vitamin B in local rice bran, wheat germ, and dried yeast; the vitamin B and G content of tikitiki extract; and the content of vitamins A, B, C, and G in the mountain apple (*Eugenia malaccensis*). Data are also reported on the H-ion concentration of various extracts of Chinese cabbage and on the composition, including proximate and mineral analyses, of opihi and two samples of rice bran.

[Food utilization studies at the Massachusetts Station], C. R. FELLERS ET AL. (*Massachusetts Sta. Bul. 293 (1933), pp. 25, 41, 42*).—This progress report (E.S.R., 67, p. 473) summarizes the results of studies on the vitamin C content of apple juice freshly extracted by a centrifugal extractor and the same juice after standing for 24 hours, pasteurized and benzoated ciders, strained and unstrained apple sauce, different varieties of apples, different structural parts of the apple, and apples before and after storage; on cranberries, including, in addition to studies noted from another source (E.S.R., 69, p. 142), manufacturing methods for sauce, juice, and jelly; and on the retention of vitamin C in frozen strawberries and strawberry ice cream (E.S.R., 68, p. 407), the vitamin C content of native, Maine, and Newfoundland blueberries, fresh, frozen, and canned, and the vitamin A and C content of fresh asparagus.

Low-cost diets for emergency use, H. T. BARTO, J. OUTHOUSE, and S. WOODRUFF (*Illinois Sta. Circ. 406 (1933), pp. 12*).—This circular, prepared in April 1933 to meet the needs of families whose expenditures for food are forced to the minimum, includes a list of essential foods with their chief contributions to the diet, suggestions as to how to save money in buying, menus for one week planned with low-cost foods, low-cost food budgets for one week for families of different sizes, suggestions for saving flavor and nutritive value in low-cost diets, and selected recipes.

It is emphasized in the foreword that while the menus suggested are nutritious, "the extent to which they are palatable and appetizing depends on the ingenuity used in planning and preparing the meals."

A study of the relative economy of cured hams of different sizes, A. M. CHILD and M. HOVLID (*Jour. Amer. Dietet. Assoc., 8 (1932), No. 2, pp. 180, 181*).—In this brief contribution from the Minnesota Experiment Station, tabulated data are given on the cooking time, evaporation, dripping, and total losses, percentage of edible and nonedible portions, and servings per pound of the uncooked meat of large, medium, and small unskinned hams and large skinned hams, the figures reported being the average of 6 hams in each group.

The least time per pound was required for the large skinned ham, followed by the large unskinned ham. Evaporation losses were least in the medium and dripping and total losses in the small hams. The percentages of edible material, and consequently the number of servings per pound, were highest for the medium, followed in decreasing order by the small, the large skinned, and the large hams.

Soy-bean paste as an emulsifying agent, A. M. FIELD, B. H. ALEXANDER, and E. B. SYLVANUS (*Science*, 77 (1933), No. 1986, p. 91).—A cooked soybean paste is recommended as a satisfactory emulsifying agent in place of eggs in the preparation of salad dressing of the mayonnaise type. Among the merits claimed are low cost, ease of shipping and storing the beans, heat sterilization of the paste immediately before use, and the incorporation of a rather large volume of liquid for a given viscosity. Preliminary observations indicate that emulsions made with the soybean paste may be less sensitive than those made with eggs to low temperature storage, but more sensitive to excessive amounts of seasoning, particularly salt.

Observations on changes in raspberries after picking, T. RENDLE (*Analyst*, 58 (1933), No. 683, pp. 69–77).—Attention is called to the remarkable rapidity of the ripening process in raspberries not only on the vines but also after picking. Comparatively large quantities of volatile organic substances have been demonstrated in freshly picked raspberries in contrast with other fruit. This is attributed to a greater degree of enzymic activity in raspberries rather than to inherent differences in the unripe fruit.

A further effect of the ripening process is the rapid change in the pectic substances, with destruction of gelling powers. Evidence is presented that the pectin in freshly picked ripe raspberries changes so rapidly that after 24 hours' storage at normal summer room temperature the gelling power has disappeared completely. "It may well be that failure to recognize this is responsible for the divergence of opinion which has often been expressed concerning the ability of raspberries to produce a jam of firm consistence without the addition of pectin from other sources, and it is evident that the very rapid character of the natural changes occurring in the pectic bodies in raspberries makes it extremely difficult in large-scale working to produce jam sufficiently firm without the use of added pectin."

It was found that by heating the fruit immediately after picking to 180° F. and then storing at between 10° and 15° the full gelling power of the original pectin could be retained for at least a year. The striking difference between the behavior of raspberries and other fruits in regard to pectic changes was shown further in a series of tests in which purified apple pectin and citrus pectin in aqueous solution were mixed, respectively, with raspberries and black currants in such proportions that an extract of the mixture when boiled with sugar to 66.6 percent sugar concentration, after adjusting the acidity to a common standard, gave a stiff gel. Gels were made at the beginning of the experiment and after 24 hours' storage of the fruit at 95°, with and without previous heating at 180°. The gelling power of both pectins was destroyed by the unheated but not by the heated raspberry juice on standing, while that of black currants was only slightly affected.

The pectin content of some Philippine fruits, F. T. ADRIANO, H. L. YLIZARDE, and E. VILLANUEVA (*Philippine Jour. Agr.*, 3 (1932), No. 4, pp. 273–279).—Of 14 Philippine fruits analyzed for pectin content, the rind of Tahiti lime was found to contain the largest amount, 2.63 percent. Besides Tahiti rind, bignay, native orange, duhat, mabolo, naranjita, santol, hevi, and guava were found to contain a sufficient amount of pectin for making jelly. The percentages in fresh and moisture-free samples of the 14 fruits are tabulated.

A new quick frozen fruit product, D. G. SORBER (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 11 (1932), No. 8, pp. 229, 230, 249, 255, figs. 2).—Experimental work reported by Chace and Poore (*E.S.R.*, 67, p. 622) on the quick freezing and storage of fruit juices has been extended to various fruit pulps. It was first found that pulps from soft, ripe apricots mixed with sugar sirup and frozen quickly at low temperature retained the natural flavor and color of the fresh ripe fruit and had a very smooth texture suitable for frozen desserts. In later experiments with other fruits, the grinding and sieving of the fruit was done in one operation with a Sep-Ro-Siv. The freezing was done in a liquid contact freezer, using alcohol and solid carbon dioxide. The temperature for successful freezing and the amount and concentration of the sirup varied with the different fruits. In most instances freezing temperatures of between -40° and -60° F. were satisfactory and added sugar of between 20 and 30 percent.

Data are given on the percentages of pulp obtained from different kinds of fruits and the proportion of pulp, sugar, and strength of sirup found satisfactory with several of the fruits tested.

Of the several fruits tested a fresh hybrid plum, a cross of the Methley and Wickson varieties, proved the most popular in flavor when frozen. Canned Royal Ann cherries gave a pleasing product. The addition of 15 percent pineapple juice to Bartlett pear pulp brought out the natural flavor of the pear. Among the uses suggested for frozen fruit pulps are as a frozen fruit dessert or in the defrosted state as a fruit flavor for ice cream and sherbets or as a dressing for ice cream sundaes.

The influence of bran on the alimentary tract, M. S. ROSE, G. MACLEOD, E. McC. VAHLTEICH, E. H. FUNNELL, and C. L. NEWTON (*Jour. Amer. Dietet. Assoc.*, 8 (1932), No. 2, pp. 133-156).—Following an extensive review of the literature on the subject, four series of experiments dealing with the laxative effect of bran are reported and discussed.

The first consisted of feeding experiments on rats to determine the laxative effect of varying amounts of bran prepared for human consumption, taken in conjunction with diets adequate, low, and completely lacking in vitamin B. A comparison was also made of the laxative action of the bran with that of other common laxatives. The ratio of the weight of the rat to the weight of the dry feces was taken as a criterion for laxative effect. On diets adequate in vitamin B, 0.6 g of the bran daily proved definitely laxative. The leached bran and filter paper were almost as effective, but the ash of the bran was ineffective. On diets lacking entirely in vitamin B 2.4 g, and on diets low in vitamin B 1.2 g of the bran were required for definite laxative effect. Of the other laxatives used for comparison, cascara, senna tea, and a vegetable-fruit paste did not have as much effect as the bran in the doses given, but milk of magnesia, through increasing the water output, had a definite laxative action.

In the second series 38 girls from 10 to 16 years of age, living in an institution under regular routine and on an adequate diet, served as subjects, each receiving 2 tablespoonfuls (14 g) of prepared bran as an addition to the regular breakfast cereal for a period of 4 weeks. The number of defecations daily was taken as the criterion of laxation. Definitely increased laxation was noted in 50 percent of the cases, no effect in 15, and a doubtful effect in 35 percent.

The next series was arranged to study the laxative effect of finely ground cereal bran when added to the ordinary varied diet. Five adult women, 3 of whom led an active and 2 a sedentary life, served as subjects. A preliminary period of 1 week without bran was compared with similar periods at the end of 1 month and for all but 1 of the subjects at the end of 2 months, respectively, during which 34 g of bran was added daily to the diet. In every case the weight

of both dry and wet feces increased during the bran feeding, and the response was as satisfactory in the second as in the first month.

The final experiment was conducted on rats to determine the effect of bran on the tissues of the alimentary tract. Histological studies were made of the alimentary tracts of 24 rats, 2 of which had been on an adequate diet without bran for 8 months, 4 on an adequate diet plus 0.6 g of bran for 4 months, 6 on an adequate diet plus 1.2 g of bran, 6 on an adequate diet plus leached bran from 1.2 g of bran, and 6 on a diet lacking vitamin B plus 1.2 g of bran. In the last three groups 2 of the animals were kept for 8, 2 for 12, and 2 for 16 weeks on the experimental diet. In no case were any lesions found, thus leading to the conclusion that bran fed in moderate quantities such as is used in human consumption will not damage the tissues of the normal alimentary tract.

A list of 30 references to the literature is appended.

The form of the stool as a criterion of laxation, G. R. COWGILL, W. E. ANDERSON, and A. J. SULLIVAN (*Jour. Amer. Med. Assoc.*, 101 (1933), No. 4, pp. 273-275, figs. 4).—This supplements the earlier reports of the authors (E.S.R., 69, p. 303) by observations on the form and nature of the stools in various degrees of laxation.

Dietetics in warm climates, J. N. LEITCH (*London: Harrison & Sons, 1930*, pp. 486, figs. 59).—In the first three chapters of this reference book the general principles of dietetics in the Tropics are discussed with reference to original investigations in different tropical countries. Chapter 4, which comprises about one third of the entire volume, presents in geographical order a survey of dietaries in tropical countries based upon information obtained in reply to circular letters sent to directors of medical and sanitary services asking for information on the calorie value and the proportion of proteins, carbohydrates, and fats in an optimal dietary for various classes of labor in the Tropics, the analysis of local foodstuffs, the vitamin content of the customary dietaries especially with regard to vitamins A and D, and the presence or absence of diseases due to lack of vitamins among the people on these dietaries. Chapter 5 contains general information on the common foodstuffs of the Tropics, with occasional recipes, and chapter 6 analyses of most of these foodstuffs. Chapter 7 on tropical dietaries consists chiefly of an analysis of the subject matter of chapter 4. Chapter 8 discusses avitaminoses and other diseases associated with defective dietaries in the Tropics, and chapter 9 food intoxication and poisoning. The final chapter, entitled The Future, contains suggestions for remedying the various dietary defects shown in the preceding chapters.

Numerous literature references are given as footnotes, and a number of photographs are included of tropical foods and of the effects of food deficiency diseases on animals and human beings.

Standards for predicting basal metabolism.—I, prediction for girls from 17 to 21, M. E. STARK (*Jour. Nutrition*, 6 (1933), No. 1, pp. 11-35, figs. 4).—Previously noted from a more detailed report (E.S.R., 68, p. 855).

Standards of basal metabolism for children of retarded growth, A. TOPPER (*Amer. Jour. Diseases Children*, 45 (1933), No. 6, pp. 1203-1210, figs. 6).—Data are reported on the basal metabolism of 20 children from 5½ to 14 years of age who were greatly retarded in growth but considered normal in all other respects. The figures obtained conformed to none of the prediction standards usually employed except that of total calories referred to age.

The author concludes that "in evaluating figures obtained from tests on the basal metabolism made on children who were much retarded in growth, each child should be considered as a standard for himself. Changes in the metabolic rate that may occur from time to time should be referred to the individual

basal rate of that particular child rather than to any known standards of metabolism, except perhaps that referred to age, as all other standards are too low for this type of child."

Metabolism of women during the reproductive cycle.—V, Nitrogen utilization, H. A. HUNSCHER, E. DONELSON, B. NIMS, F. KENYON, and I. G. MACY (*Jour. Biol. Chem.*, 99 (1933), No. 2, pp. 507-520, figs. 2).—This continuation of the series of papers noted previously (E.S.R., 66, p. 387) reports nitrogen balances for the three subjects of the previous studies for a total period of 144 days, including 49 at intervals during pregnancy, 70 in lactation, and 25 in post lactation. For purposes of comparison existing data from the literature on nitrogen metabolism during pregnancy and puerperium have been compiled. The conclusions drawn from the assembled data are as follows:

"The records indicate that the maternal body retains in pregnancy a considerable excess of nitrogen beyond that required for the fetus and its adnexa. Following parturition, there is a loss which persists over the first two weeks or more of the puerperal period. There is evidence that the mother has the ability to maintain nitrogen equilibrium during established lactation and post lactation. In short, the nitrogen metabolic balance studies, although of brief duration, would indicate that under favorable circumstances the reproductive cycle is a period of nitrogen acquisition for the mother."

Observations on the metabolism of carbohydrate, D. S. WALLER (*Jour. Amer. Dietet. Assoc.*, 8 (1932), No. 2, pp. 119-132).—In this contribution from the department of internal medicine of the Medical School of the University of Michigan, contradictory points of view concerning the utilization of carbohydrate by the diabetic are discussed and clinical data bearing upon the problem are reported, with the conclusion that increase or decrease of fat with constant amounts of dietary glucose is without effect upon either the total amount of available glucose which can be metabolized by patients not receiving insulin or the amount of insulin required to maintain aglycosuria. The amount of available glucose metabolized per unit of exogenous insulin was shown to increase with the increase in the amount of available glucose up to 100 g beyond the tolerance of a diabetic patient.

In discussing the application of these findings to the treatment of diabetes, the author expresses the opinion that "the patient with mild or moderately severe diabetes may be given diets which meet his energy requirement, without the use of insulin, by the use of diets 'high fat' in character. For those patients, however, whose tolerance does not permit the construction of a diet equal to their energy requirement, and for whom insulin is therefore indicated, the most efficient use of the insulin given will be made if the carbohydrate of the diet is significantly increased."

A study on the effects of fatty acid on nutrition, U. TANGE (*Bul. Agr. Chem. Soc. Japan*, 8 (1932), No. 10-12, pp. 159-172, figs. 10).—Experiments are reported confirming the work of Burr and Burr (E.S.R., 63, p. 595) in the production of a deficiency disease in rats on rigidly fat-free diets and its cure with linoleic and linolenic acids. Of other purified fatty acids tested, oleic and elaidic induced growth response in rats on the fat-free diet but were ineffective in curing the pathological symptoms. Rats receiving one drop of clupanodonic acid suddenly lost weight and did not respond to either linoleic or linolenic acid. Stearic acid in 0.5 percent concentration induced rapid growth for a period, after which the animals suddenly lost weight and died. Vitamins B and G were both ruled out as limiting factors in the deficiency.

Several photographs showing the pathological lesions, particularly in the claws and tail, are included. Attention is called to the resemblance between

the skin lesions and the condition described by Parsons as resulting from diets containing a high percentage of egg white (E.S.R., 65, p. 489).

Diet and blood cholesterol in normal women, R. OKEY and D. STEWART (*Jour. Biol. Chem.*, 99 (1933), No. 3, pp. 717-727).—"Data for free and total cholesterol of whole blood samples taken three times weekly are reported for four normal women who were placed successively, for periods of approximately 1 month each, on (1) a constant diet low in cholesterol, (2) one containing a moderate amount of cholesterol in egg yolk and liver, and (3) a diet low in food cholesterol to which a like amount of cholesterol as such was added.

"The mean values for the month for both total and free cholesterol were consistently somewhat higher than for the control diet, both when the diet containing egg yolk was given and when cholesterol as such was added to the control diet, but the diet containing the egg yolk produced the greater effect. Percentage of esterified cholesterol became slightly higher with increased cholesterol intake."

The effect of the egg yolk is considered to be of significance in light of the increasing number of reports of the development of arteriosclerosis in comparatively young diabetics incident to the treatment of the disease with high fat diets containing, as a rule, many eggs.

The high cholesterol intake was found to have very little, if any, effect upon menstrual variations in blood cholesterol.

The constitution of an artificial diet in the light of experiences of long duration on the relation between alimentation and the phenomena of growth, maintenance, and particularly reproduction [trans. title], L. RANDOIN and H. SIMONNET (*Compt. Rend. Acad. Sci. [Paris]*, 195 (1932), No. 25, pp. 1328-1330, figs. 2).—The rat diet proposed, which is given as a powder in quantities of from 10 to 15 g per animal per day, consists of pancreatic muscle peptone 15, purified casein 2, dried brewery yeast 3, purified butter 12, pure rice starch 32, sucrose 32, and Osborne and Mendel salt mixture 4 percent, with filter paper ad libitum. On this diet three pairs of rats have reproduced regularly for 18 months, with 6, 8, and 10 gestations, respectively, the litters being normal in numbers and growth. During a period of 3 years in which the diet was fed exclusively 10 generations were produced of animals normal in every respect.

Is longevity compatible with optimum growth? C. M. McCAY (*Science*, 77 (1933), No. 2000, pp. 410, 411).—Data from the literature and from the author's laboratory are cited suggesting that rat diets which have proved most satisfactory as far as reproduction and rapid growth are concerned are not conducive to longevity. "It is possible that longevity and rapid growth are incompatible, and that the best chance for an abnormally long life span belongs to the animal that has grown slowly and attained a late maturity."

Bibliography on heavy metals in food and biological material.—II, Lead. III, Zinc. IV, Manganese. V, Mercury. VI, Cobalt. VII, Nickel. VIII, Chromium, compiled by T. H. P[OPE] (*Analyst*, 57 (1932), No. 681, pp. 775-779; 58 (1933), Nos. 682, pp. 30-33; 683, pp. 91-95; 686, pp. 280, 281; 687, pp. 340, 341).—A continuation of the bibliography noted previously (E.S.R., 69, p. 148).

The copper, iron, and manganese content of fish, T. B. PARKS and E. R. ROSE (*Jour. Nutrition*, 6 (1933), No. 1, pp. 95-98).—Data are reported on the percentage of moisture and the content of copper, iron, and manganese in the fresh muscle of 20 species of fish, including both fresh- and salt-water fish. The method of Elvehjem and Lindow (E.S.R., 61, p. 612) was used for copper, of Stugart (E.S.R., 69, p. 493) for iron, and of Skinner and Peterson (E.S.R., 65, p. 12) for manganese,

The minimum and maximum values reported for copper were for the common sunfish 1.4 and ling 4.1; iron, cod and sunfish 3.4 and ling 9.6; and manganese, halibut 0.1 and yellow perch 0.44 mg per kilogram of the fresh muscle. The average copper content of salt-water fish analyzed was about the same as that of fresh-water fish, but the salt-water fish contained about 12 percent more iron than the fresh-water fish. Species with dark-colored tissue contained approximately 75 percent more iron than those with light-colored tissues. The manganese content was slightly higher in the fresh-water fish than in the salt-water types investigated.

The effect of the prolonged feeding of a milk-iron-copper diet to rats, F. A. UNDERHILL, J. M. ORTEN, E. R. MUGRAGE, and R. C. LEWIS (*Jour. Biol. Chem.*, 99 (1933), No. 2, pp. 469-472).—Rats kept from weaning until from 346 to 395 days of age on whole milk ad libitum supplemented by 0.5 mg of iron and 0.025 mg of copper 6 days a week had lower body weights, averaging 317 g, than normal controls on the stock diet, which averaged 437 g at 395 days. Erythrocyte counts and hemoglobin and cell volume values were only slightly lower than for the controls, but no gross abnormalities were apparent on autopsy.

In another group kept on the milk-iron-copper diet from weaning until from 450 to 454 days of age, the body weights were also somewhat lower than those of normal stock rats of comparable age. The blood findings were almost identical with those in the first group, and no abnormalities were observed on gross or histological examination.

Two other rats were allowed to develop severe anemia on the milk diet and then given the milk-iron-copper diet until 667 days of age. The blood findings agreed with those of the other two groups, and no pathological changes were observed on autopsy.

These findings are thought to indicate that rats can be maintained in an apparently normal condition for prolonged periods of time on an exclusive milk-iron-copper diet.

A note on the calcium content of cabbage, S. J. COWELL (*Biochem. Jour.*, 26 (1932), No. 5, pp. 1422, 1423).—Attention is called to the very high content of calcium in the outer green leaves of cabbage as compared with the inner leaves. A few data obtained by the McCrudden method with wet ashing are reported in illustration. In one sample the outermost leaf, dark green in color, had a calcium content of 1,058 mg per 100 g moist leaf; the third leaf from the outside, dark green, 216; an inner leaf, pale greenish yellow, 71; and a heart leaf, yellowish white, only 32 mg per 100 g.

Calcium balances: Their interpretation, study, and pathology [trans. title], P. PAGET, LANGERON, and CORDONNIER (*Jour. Pharm. et Chim.*, 8. ser., 17 (1933), No. 6, pp. 248-260).—Practical suggestions are given for conducting calcium metabolism experiments on human subjects and for interpreting the data. Clinical case reports are included showing the value and limitations of the method in the diagnosis of various pathological conditions.

Cobalt in animal nutrition, F. J. STARE and C. A. ELVEHJEM (*Jour. Biol. Chem.*, 99 (1933), No. 2, pp. 473-483).—This paper describes a convenient and simple colorimetric method for the estimation of cobalt in biological materials applicable to samples containing from 0.01 to 0.5 mg of cobalt.

Analyses by this method of rat, dog, and beef liver, Abbott's liver extract, lobster, canned peas, milk, yeast, and lettuce gave negative results, indicating that cobalt, if present, must have been in extremely small amounts. No cobalt could be detected in the entire bodies of rats fed a milk-iron-copper-manganese diet, but it was found in rats fed a similar diet supplemented by cobalt in

amounts proportional to the amount of cobalt fed. Polycythemia was produced in the presence of from 0.04 to 0.05 mg of cobalt in the entire body of the rat.

In pigs receiving no cobalt the element could not be detected in any of the tissues, but definite quantities were found in practically all tissues of similar animals receiving cobalt. The greatest concentration was in the liver, pancreas, and spleen. The vertebrae and ribs contained appreciable amounts, while none could be detected in the long bones.

Blood volume studies in cobalt polycythemia, J. M. ORTEN, F. A. UNDERHILL, E. R. MUGRAGE, and R. C. LEWIS (*Jour. Biol. Chem.*, 99 (1933), No. 2, pp. 457-463).—To determine whether the polycythemia produced in rats by the addition of cobalt to a milk-iron-copper diet is relative, as the result of a decrease in blood plasma volume; apparent, as the result of a redistribution of inactive cells; or true, through the actual addition of erythrocytes to the circulation; plasma, cell, and total blood volumes were determined in normal and cobalt-fed polycythemic rats. The results indicated that the increase in blood volume in polycythemia is due to a rise of cell volume rather than to any significant variation of plasma volume. It is thus concluded that "cobalt supplementing a milk-iron-copper diet produces a true polycythemia."

The effect of manganese on cobalt polycythemia, J. M. ORTEN, F. A. UNDERHILL, E. R. MUGRAGE, and R. C. LEWIS (*Jour. Biol. Chem.*, 99 (1933), No. 2, pp. 465-468).—All of the polycythemic animals of the series fed milk with various metals in addition to iron and copper (E.S.R., 68, p. 129) were continued on their respective dietary supplements, and further determinations of hemoglobin, erythrocytes, and cell volumes were made when the animals were from 255 to 282 and from 395 to 402 days of age.

At the earlier age the animals of the cobalt-manganese group showed a much more pronounced polycythemia than those of the group receiving cobalt but no manganese. When the animals were killed at from 395 to 402 days of age the cell volume and hemoglobin values were still very high, and there was only a slight decrease in the erythrocyte count in the group receiving manganese, while in the animals not receiving manganese in addition to the cobalt all of the values had decreased. It is concluded that manganese has some stabilizing influence on the increased hemoglobin, erythrocyte, cell volume, and blood volume values characteristic of cobalt polycythemia, and acts in some way to alleviate the toxic condition resulting from the long-continued administration of small quantities of cobalt.

A review of fluorine and its physiological effects, F. J. McCLURE (*Physiol. Rev.*, 13 (1933), No. 3, pp. 277-300).—This literature review deals with the distribution of fluorine in minerals, soils, and waters, plants and other foodstuffs, bones and teeth, and other animal organs and tissues; its possible significance in the animal body; the effect of small quantities of ingested fluorides on food consumption, growth, and reproduction; the relation of fluorine to the development of teeth and bones; and the effect of fluorides on certain enzymatic changes related particularly to fat and carbohydrate metabolism. A bibliography of 127 titles is appended.

A comparison of the value of ferrous iodide administered directly and indirectly, H. C. CAMERON (*Soc. Expt. Biol. and Med. Proc.*, 30 (1933), No. 6, pp. 762-765, fig. 1).—In this continuation of the discussion as to whether or not ferrous iodide can replace vitamin A in the cure of xerophthalmia in rats, as claimed by Chidester (E.S.R., 68, p. 415), data are presented showing that ferrous iodide is as ineffective in this respect when given as part of the diet as when administered separately. There was no evidence of greater toxicity for the ferrous iodide when given by pipette than as a part of the diet.

The unequal content of manganese in green and etiolated leaves [trans. title], G. BERTRAND and M. ROSENBLATT (*Bul. Soc. Sci. Hyg. Aliment.*, 20 (1932), No. 5-6, pp. 228-230).—Data are reported on the manganese content in terms of milligrams percent of the fresh and dry material and ash of green and etiolated leaves of dandelion greens, chicory and endive, common and romaine lettuce, and cabbage and celery. In each case the green leaves were richer in manganese than the etiolated leaves of the same plant.

Studies on the mineral metabolism during pregnancy and lactation.—II, K. U. and G. TOVERUD (*Biochem. Jour.*, 26 (1932), No. 5, pp. 1424-1434, pl. 1, fig. 1).—Earlier experiments on pregnant women and on dogs having suggested that deficiency in calcium and phosphorus is a more important factor than deficiency in fat-soluble vitamins in producing negative calcium and phosphorus balances, a more thorough study was conducted on dogs, as follows:

A year-old bitch was given a ration low in calcium and phosphorus, but supplemented with cod-liver oil during the gestation period at the end of which she gave birth to two normal-looking puppies. Both puppies were allowed to stay with the mother for 5 weeks and were then given the mother's ration except that one received no cod-liver oil. Frequent calcium and phosphorus metabolism experiments were conducted on all of the animals, and when 112 days of age the puppies were killed and chemical analyses made of their radii.

At death the clinical appearance of both puppies was similar except that the one receiving no cod-liver oil was in better condition than the other which had developed fractures. Chemical and histological examinations of the bones showed that the puppy receiving no cod-liver oil was suffering from rickets, while the condition of the other corresponded rather with osteoporosis. The findings are thought to afford further proof that "cod-liver oil, even present in sufficient amount throughout the fetal life and lactation period, cannot protect the bones from undergoing an extreme osteopathic process resulting in multiple fractures when the mineral intake is low. This finding agrees well with the statements of many previous investigators that the D vitamin has less influence upon the balance of Ca than upon the intermediary distribution of Ca to the epiphyses of the long bones."

Attention is called to the fact that the clinical findings of osteoporosis and rickets in growing animals are almost impossible to differentiate, and that many times a condition is diagnosed as rickets when osteoporosis is the main pathological process. "The two conditions may also be so combined in one individual case that a true clinical differentiation is impossible. The difference may be evident only on histological examination."

The specific action of corn, barley, and other cereal grains on bone development [trans. title], J. C. DE RUYTER DE WILDT and E. BROUWER (*Ver. Exploit. Proefzuivelboerderij Hoorn, Verslag 1931*, pp. 157-182, fig. 1; *Ger. abs.*, p. 181; *Eng. abs.*, p. 182).—The relative antirachitic properties of various cereal grains were tested by feeding groups of rats mixtures of 76 parts of the cereal in question with 20 parts of gluten meal, 3 of CaCO_3 , and 1 of NaCl , as in the Steenbock-Black rachitic diet, and observing the growth and bone development (Röntgen rays) at varying intervals.

Corn afforded no protection and barley considerable protection against rickets, with wheat and rye occupying intermediate positions. The effect of oats could not be determined, as the rats did not grow well. The growth on the other cereals was in increasing order of corn, wheat, and barley and rye. Differences in growth could not be attributed to differences in the phosphorus content of the diet, for there was no change following adjustment of the phosphorus content of the diets to the same level.

The vitamins, C. D. MILLER (*Hawaii Univ., Occas. Papers No. 16 (1932)*, pp. 9).—This contribution from the nutrition laboratory of the Hawaii Experiment Station consists of a brief discussion of vitamins from the point of view of local needs and food habits and a table of relative distribution of vitamins A, B, C, and G in common foods, including important local foods. The values for some of the Hawaiian foods are based upon published and unpublished studies in the author's laboratory.

Unscrambling the vitamins.—I, Vitamins A and B (B₁). II, Vitamins C and D, S. L. SMITH (*Med. and Prof. Woman's Jour.*, 40 (1933), Nos. 6, pp. 136–141; 7, pp. 178–183).—In this review of recent literature concerning the chemical nature and nutritive functions of vitamins A, B, C, and D, particular emphasis is given to the dissimilarity of these vitamins in chemical structure and physiological properties. The list of 67 literature citations includes references available through April and in some instances May 1933.

The vitamin A and B contents of the Nancy Hall sweet potato, F. L. MACLEOD, A. TALBERT, and L. E. TOOLE (*Jour. Home Econ.*, 24 (1932), No. 10, pp. 928, 929).—In this preliminary report it is stated that the Nancy Hall sweetpotato has been found to contain approximately 30 (Sherman) units per gram of vitamin A and 0.7 unit per gram of vitamin B.

A study of halibut-liver oil.—I, With respect to its vitamin potency, physical constants, and tolerance, A. D. EMMETT, O. D. BIRD, C. NIELSEN, and H. J. CANNON (*Indus. and Engin. Chem.*, 24 (1932), No. 9, pp. 1073–1077, figs. 4).—This investigation was carried out on 30 samples of halibut-liver oil independently by two laboratories, using identical methods. The biological methods for both vitamins A and D were those recommended in the 1931 report of the vitamin committee of the American Drug Manufacturers Association.^a For vitamin A a modified Carr-Price colorimetric method was also used.

Close agreement was shown between the results reported from the two laboratories, and the biological values for vitamin A were also in close agreement with the values obtained by the colorimetric method. "The vitamin A potency per gram of oil ranged from 37,500 to 62,500 units, with an average for the 30 samples of 49,583 units. Compared with the standard 500 gram-unit cod-liver oil, the halibut-liver oil was from 75 to 125 times more potent than cod-liver oil. This shows that halibut-liver oil is an extremely potent source of vitamin A. The antirachitic vitamin D potency per gram of oil varied from 2,000 to 3,333 daily units, averaging 2,479 units. This is much greater than for cod-liver oil. In fact, as a natural source of vitamin D, halibut-liver oil occupies a very high place."

Determinations of the physical constants showed essentially the same values for halibut-liver oil and the standard cod-liver oil for specific gravity and saponification number, higher values for halibut-liver oil for free fatty acid and nonsaponifiable residue, and lower iodine numbers.

Tolerance tests on rats showed that the halibut-liver oil produced no harmful effects when fed over periods of from 50 to 100 days in amounts furnishing as much as 10,000 times the daily requirement of vitamin A and 400 times the requirement of vitamin D. The excess vitamin A was stored to a large degree in the liver.

Commenting upon these findings, the authors state that "halibut-liver oil, as far as the authors are aware, is the richest known natural source of vitamins A and D. The high vitamin A content of this oil is particularly valuable because this vitamin exerts a direct influence on the growth and development of the young, and may be an aid toward the establishment of better resistance

^a Jour. Amer. Pharm. Assoc., 20 (1931), No. 6, pp. 588–594.

of the body to infections in general. Further, the tolerance to halibut-liver oil by the experimental animals—even in massive doses—indicates that it can be taken with impunity and accepted as a valuable accessory to human nutrition."

The effect of cooking on the vitamin A and C content of fresh and dried apricots, A. F. MORGAN, A. FIELD, and P. F. NICHOLS (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 9, pp. 841-850, figs. 4).—The studies reported in this contribution from the California Experiment Station deal with the effects of processing and resulfuring and of cooking on vitamins A and C in sulfured and unsulfured apricots.

The fruit, Royal apricots, prepared as previously described (E.S.R., 64, p. 789), included fresh frozen; sulfured, sun-dried, unsulfured, sun-dried packed in 8-oz. cans and stored at 0° C.; and sulfured, sun-dried apricots held in ordinary storage at room temperature for 5 months and then processed and resulfured according to current commercial practice. The fresh apricots were cooked in approximately 500-g lots without added water and the dried samples in individual doses soaked in a small quantity of warm water 15 minutes before cooking. All of the samples were cooked in a covered container over boiling water. In the case of the fresh apricots the temperature was brought to 85° in 15 minutes and maintained there for 5 minutes. Some of the dried fruit was also soaked for 2½ hours in boiling water and cooked for 15 minutes over an open flame.

The methods for determining vitamins A and C were those previously described (E.S.R., 64, pp. 495, 789). From the data reported the minimum protective dose for vitamin C of the raw fruit was estimated to be 15 g, of cooked fresh fruit 25 g, of the raw and cooked sulfured, dried fruit the equivalent of 16 g, and of the stored, processed, and resulfured fruit, both raw and cooked, the equivalent of from 29 to 36 g of the fresh fruit. The raw, unsulfured, dried fruit was practically devoid of vitamin C and was not tested after cooking. The data are interpreted as indicating a loss of from 30 to 50 percent of the vitamin C content of the fresh fruit on cooking, a much smaller loss of the vitamin in the sulfured, dried fruit on cooking, and a loss of approximately 50 percent of the vitamin C of the fresh fruit on commercial storing, processing, and resulfuring, but no further loss on cooking. Storage of the sulfured fruit at room temperature in closed cans for one year caused a 60 percent loss of vitamin C and a 31 percent loss of sulfur dioxide. No further change in vitamin C, but a loss of about 50 percent of the remaining sulfur dioxide, occurred on soaking the fruit in water for 2½ hours and then boiling it vigorously for 15 minutes.

The vitamin A value of the cooked fresh fruit was found to be "somewhat greater than that of the corresponding raw fruit. This is ascribed to better intestinal utilization of the former, possibly because of enzyme destruction or because of better carotene absorption. Little change in the vitamin A value of the dried fruit samples was brought about by cooking, but the losses caused by the drying process amounted to 59 to 74 percent in the sulfured, 76 to 82 percent in the unsulfured, and 71 to 82 percent in the processed fruit. Attention is called to the extraordinarily large vitamin A content of both fresh and dried apricots, which are equal in this respect to good butter, cheese, cream, and spinach. The number of international units of vitamin A (0.001 mg carotene) per pound is calculated to be about 10,000 for the fresh raw apricots and 12,000 to 15,000 for the dried fruit."

Vitamins and infections [trans. title], A. FRANK (*Ztschr. Vitaminforsch.*, 1 (1932), No. 1, pp. 51-62).—Attention is called briefly to the literature dealing

with the relation of vitamins A, B, C, and D to infections. The author observes in conclusion that the assumption of a decrease in infection through a vitamin-containing diet or an increase in the danger of infection through avitaminosis and hypovitaminosis is well founded. All vitamins are thought to be concerned, and in all infections, particularly chronic, it is well to provide a satisfactory supply of vitamins. In his opinion the question is still open as to whether the influence of the vitamins in infection owes its explanation to a higher consumption during infection, or whether a lack of vitamins leads to a decreased immunity or lowered resistance or harm to the organism in some other way.

An extensive list of literature references is appended.

Biochemistry and pathology of avitaminosis.—I, Hematopoietic function in deficiency diseases, B. SURE, M. C. KIK, D. J. WALKER, and M. E. SMITH (*Arkansas Sta. Bul.* 286 (1933), pp. 39, figs. 8).—This bulletin presents the complete series of previously noted studies of the author and his associates on the relation of vitamin deficiency to anemia, including hematopoietic function in deficiency of vitamin A (E.S.R., 66, p. 198), vitamin B (E.S.R., 62, p. 297; 68, p. 417), vitamin E (E.S.R., 62, p. 297), and vitamins D and C (E.S.R., 66, p. 199).

Avitaminoses and latent dystrophies [trans. title], G. MOURIQUAND (*Ztschr. Vitaminforsch.*, 1 (1932), No. 1, pp. 38–51).—In this theoretical discussion, the author classifies food dystrophies etiologically as those of quantitative, qualitative, and mixed origin and clinically as true dystrophy, predystrophy, and nonapparent or latent dystrophy. Special emphasis is given to latent dystrophy with relation to lack of vitamins C, B, and D. Factors considered to play a part in producing latent rather than apparent scurvy are an unbalanced diet in other respects than vitamin C, particularly a deficiency in calories, low metabolism, infections, and sensitization to lack of vitamin C through previous deficiency in this vitamin.

As an illustration of latent dystrophy in vitamin B, attention is called to the development of beriberi in infants whose mothers do not show clinical symptoms but are nevertheless in a state of latent dystrophy, and to the retardation of symptoms of polyneuritis in pigeons by reducing the deficient diet quantitatively.

As examples of latent rickets, the author discusses disturbances of calcium-phosphorus equilibrium revealed by digestive troubles, infections, etc. In the author's opinion every child nourished exclusively on cow's milk is in a state of latent calcium-phosphorus imbalance which can be revealed by a number of factors designated as antifixers of calcium. Other latent dystrophies discussed include latent spasmophilia and latent pellagra.

The vitamin A content of yellow-tissued and white-tissued apples, M. T. POTTER (*Jour. Nutrition*, 6 (1933), No. 1, pp. 99–102).—In this contribution from the Washington Experiment Station two yellow-tissued apples, Golden Delicious and Red Delicious or Starking, and one white-tissued variety, the McIntosh, were tested for their content of vitamin A by the Sherman-Munsell technic, using a 35-day feeding period according to the U.S. Pharmacopoeia procedure. The apples, which were obtained from one of the chief fruit districts in the State, were kept in a cool basement until needed, the period in storage averaging 3½ months, and were peeled and chopped just before feeding.

After preliminary tests at levels of 0.5, 0.75, 1, and 1.5 g, the 1.5-g level was selected for the main experiment. The average weekly gains for the 35-day period of 9 animals on the Starking variety and 8 each on the other two were 2.4, 4.4, and 5 g for the Starking, Golden Delicious, and McIntosh,

respectively. Inasmuch as the growth rate was highest on the white-tissued apple, the author concludes that "it would appear that the presence of yellow pigment in the apple is not related to vitamin A potency."

The stability of vitamin A in cod-liver oil emulsions, H. N. GRIFFITHS, T. P. HILDITCH, and J. RAE (*Analyst*, 58 (1933), No. 683, pp. 65-68).—The possibility of considerable destruction of vitamin A in cod-liver oil on emulsification with gum acacia through the action of peroxidase in the gum acacia and the exposure of a considerable surface of the oil to air during homogenization was tested by preparing five different emulsions of cod-liver oil, allowing them to stand in well-corked amber bottles in a dark cupboard for varying periods of from 2 days to 15 months, recovering the oils from the emulsions, and testing them by the colorimetric procedure of Drummond and Hilditch (*E.S.R.*, 64, p. 694). The emulsions included two with gum acacia and 50 percent cod-liver oil and two with gum tragacanth (containing no peroxidase) and 25 percent cod-liver oil, one of each being homogenized and the other not homogenized. Another emulsion was made with gum acacia previously heated at 100° C. for 1 hour to destroy peroxidase and 50 percent cod-liver oil and not homogenized. Samples of the cod-liver oil and the homogenized emulsion with gum acacia were also tested spectrographically by R. A. Morton at the beginning of the experiment and after 7 months.

No loss in vitamin A potency could be detected in the original oil or any of the emulsions for at least 4 months. At 6 months there was some evidence of change, particularly in the original oil. At 7 months the change was evident in all of the gum acacia emulsions and the nonhomogenized gum tragacanth emulsion, and from that time onward in all of the samples. The spectrographic studies likewise showed no greater deterioration in the emulsified oils than in the original oil.

The authors conclude that the procedure followed in manufacturing emulsions of cod-liver oil does not diminish the natural stability of the vitamin A in the oil itself during storage, and that "cod-liver oil emulsions can be kept for at least 4 months without appreciable loss of vitamin A potency, and probably for 7 or 8 months without serious alteration therein, if stored in well-stoppered, amber glass bottles and kept in the dark."

Vitamin A deficiency in the dog, H. S. OLCOTT (*Soc. Expt. Biol. and Med. Proc.*, 30 (1933), No. 6, p. 767).—An unsuccessful attempt to produce xerophthalmia in dogs on a diet deficient in vitamin A is recorded briefly. Three female dogs of the same litter were placed at the age of 3 months on a diet consisting of alcohol-extracted casein 25, dextrin 10, sucrose 30, lard 25, Vitavose 6, bone ash 3, and salt mixture 1.5 percent. Each dog received daily 25 g of the ration per kilogram body weight, together with 2 drops of viosterol. All of the animals gained weight for approximately 2 months, after which they showed loss of appetite and rarely ate their entire daily ration. Two of the animals died after 77 days on the diet and the third 25 days later, all with no observable symptoms beyond extreme weakness and lassitude on the final day. No abnormalities were discovered on autopsy.

Vitamin A deficiency in castrated male rats, M. M. SAMPSON and V. KORENCHEVSKY (*Biochem. Jour.*, 26 (1932), No. 5, pp. 1542-1545).—In continuation of the series of papers noted previously (*E.S.R.*, 68, p. 865), evidence is presented showing that the changes taking place in various organs of castrated rats on a vitamin A-deficient diet do not differ from those taking place in castrated rats on a normal diet.

Continual cornified vaginal cells as an index of avitaminosis-A in rats, S. B. D. ABERLE (*Jour. Nutrition*, 6 (1933), No. 1, pp. 1-10).—In this investigation of the reliability of continual cornified vaginal cells as a symptom of

vitamin A deficiency in rats, a total of 101 female rats was used. Of these, 41 died or were killed because of the appearance of pneumonia before the vagina opened. The remaining 60 were in four groups as follows: Group I consisted of 14 rats on A-deficient diets made with extracted casein, mothers on table scrap diet; group II of 24 rats on A-deficient diets made with technical casein, mothers on table scrap diet; group III of 14 rats on A-deficient diets made with technical casein, mothers on 100 percent calf meal; and group IV of 8 rats on A-deficient diets made with tobacco seed.

All of the rats in the first three groups were weaned and placed upon the experimental diets at from 21 to 24 days of age. The average times at which the vagina opened for the three groups were 38.9, 39.9, and 37.4 days. The corresponding standard deviations of the means were 1.9, 1.3, and 1.8, showing that the time of opening was essentially the same for the three groups. The average times at which the rats showed the continual cornified smear were about the same for groups I and III, 43.4 and 46.4 days, and over 2 weeks later, 60.9 days, for group II. The longer time for this group was attributed to storage of vitamin A and traces in the diet.

The first group to show loss in weight or xerophthalmia was group III at an average of 58.7 days, followed by group I which showed loss in weight at 70.3 days and group II at 89.9 days. The greatest similarity within the group was in the members of group III whose parents were on controlled diets low in vitamin A. The intervals between the appearance of cornified cells in the vagina and the second symptom of avitaminosis were about the same for groups I and II, averaging 27.8 and 28.3 days, respectively. The interval for group III was less than half that of the other groups, 12.5 days, showing that the more rapidly the animal is depleted of vitamin A the shorter the interval between the two symptoms.

In group IV the rats were placed on the experimental diets, which contained some vitamin A, at from 28 to 37 days of age. The vaginas opened rather late and continual cornified cells did not appear until about 111.3 days. No other symptoms developed. Further study of the vaginas of 33 of the rats showed changes similar to the keratinization reported by Wolbach and Howe (*E.S.R.*, 54, p. 891) for other epithelial tissues of the body.

The authors conclude that in the female rat vaginal changes precede other symptoms of vitamin A deficiency. "It may be that the vagina becomes affected first because it represents unusually active epithelium. Or again, the cells of all of the affected membranes may become keratinized at about the same time. Cornification may appear earlier in those membranes most exposed to drying, as the vagina and cornea, but xerophthalmia may not be apparent until the cornified cells of the eyelids have become the seat of infection."

Dietary requirements for fertility and lactation—IV, The specific effect of vitamin B on lactation and growth, B. SURE, M. C. KIK, D. J. WALKER, and M. E. SMITH (*Arkansas Sta. Bul.* 284 (1933), pp. 31, figs. 18).—Summaries of several papers noted previously (*E.S.R.*, 66, p. 94; 67, p. 484; 68, p. 705) comprise this continuation of the series of bulletins on the general subject of dietary requirements for fertility and lactation (*E.S.R.*, 63, p. 693).

Do the B vitamins take part in the utilization of fats? [trans. title] R. LECOQ (*Compt. Rend. Acad. Sci. [Paris]*, 195 (1932), No. 19, pp. 827-829).—Feeding experiments on pigeons are reported briefly, leading to the conclusion that the presence of large proportions of fat in the diet does not prevent the onset of polyneuritic symptoms in the pigeon deprived of vitamin B and that consequently vitamin B is essential to the assimilation of fats. The need for

vitamin B is thought to be about equal for proteins and fats and considerably less for both than for carbohydrates.

The vitamin B content of different samples of Indian rice by Spruyt's colorimetric method.—Part I, S. GHOSH and A. DUTT (*Indian Jour. Med. Res.*, 20 (1933), No. 3, pp. 863–868).—The Spruyt color index method for determining vitamin B (B_1) (E.S.R., 63, p. 803) was used, with certain modifications, in testing over 50 samples of rice collected in or near Calcutta. As parallel and biological tests are not reported, the data presented furnish no definite proof of the reliability of the method. The conclusion is drawn, however, that the most important factor affecting the vitamin B content of rice is the degree of polishing to which the grains have been subjected.

Chemical and biological analyses of tikitiki extracts, A. J. HERMANO and F. ANIDO (*Philippine Jour. Sci.*, 50 (1933), No. 2, pp. 189–197, figs. 7).—Chemical analyses by the Official method and vitamin B_1 determinations conducted on rats are reported for a sample of crude rice bran of the usual quality purchased by the Bureau of Science, Manila, for the manufacture of tikitiki extract, and for seven brands of tikitiki extract, including one made by the Bureau of Science according to the method of Wells (E.S.R., 46, p. 569). The rice bran had the following composition: Moisture 9.02 percent, fat (ether extract) 16.96, protein ($N \times 6.25$) 13.81, ash 11.94, crude fiber 9.91, and carbohydrates (by difference) 38.36 percent. The analytical data for the extracts showed that sugar had been added to four of the samples. In the vitamin B tests the extract was fed at a level of 0.2 cc daily. As judged by curative tests and growth, three brands of the extract were excellent sources, three fairly good, and one a poor source of vitamin B.

Hydrogen ion concentration in the organs of pigeons fed on polyneuritis-producing diets, R. MCCARRISON, G. SANKARAN, and K. B. MADHAVA (*Indian Jour. Med. Res.*, 20 (1933), No. 3, pp. 739–756).—"An account is given of the results of pH determinations in healthy, well-fed pigeons and in pigeons fed on diets of which the dominant deficiency was one of vitamin B_1 . The outstanding results of the investigation were the demonstration of the increased acidity of different parts of the brain, the diminished acidity of the skeletal muscles and liver, the tendency to disturbance of the electrotonic relations of the auricle and ventricle of the heart, and the slight tendency to increased acidity of certain organs in the deficiently-fed birds."

A highly satisfactory vitamin B deficient ration, B. SURE (*Soc. Expt. Biol. and Med. Proc.*, 30 (1933), No. 6, pp. 779, 780).—Continued growth of negative controls on the usual vitamin B-deficient ration was traced to inadequate purification of the casein and difficulty in destroying all traces of vitamin B in the autoclaved dried baker's yeast used as the source of vitamin G. To remedy the first difficulty a new method of purifying the casein was developed as follows:

"Three kg of casein are suspended in 30 l of tap water to which are added 50 cc glacial acetic acid and 5 cc chloroform and 5 cc toluene as preservatives. The water, acetic acid, and preservatives are changed daily for a period of 14 days. During the last 3 days of this period distilled water is used instead of tap water. The casein is then dried at 100° C. and ground. Five kg of the dried acid washed casein are subsequently suspended in 25 l of 25 percent ethyl alcohol, by volume, and soaked for 24 hours. During this period the casein is stirred in the alcohol for 12 hours with a mechanical stirrer. This operation is conducted at room temperature. The casein is then filtered through a large Buchner funnel, dried at 100°, and ground."

In place of autoclaved yeast as the source of vitamin G, autoclaved round steak has been substituted because of its lower content of vitamin B. The

steak is cut in small cubes, heated for 6 hours at 20 lb. pressure, dried at 100°, and ground.

On the ration deficient in vitamin B complex, consisting of casein (purified as described) 20, agar 2, McCollum's salt mixture 185 4, filtered butterfat 10, and dextrin 64 parts, depletion is said to be secured in 2 or at the most 3 weeks. After this depletion the rats are placed on the vitamin B-deficient ration, consisting of purified casein 10, McCollum's salt mixture 4, filtered butterfat 10, autoclaved dried round steak 15, and dextrin 61 parts. The complete depletion of vitamin B reserves is said to take place in 2 or 3 weeks, followed by rapid loss of weight and death.

The production of glucuronic acid in scurvy, A. J. QUICK (*Jour. Biol. Chem.*, 100 (1933), No. 2, pp. 441-444).—Data are reported and discussed refuting the assertion of Rygh and Rygh (*E.S.R.*, 69, p. 10) that guinea pigs on a scurvy-producing diet lose their ability to synthesize vitamin C. Attention is called to the abnormally large adrenals observed in scorbutic guinea pigs.

Studies relative to the estimation of vitamin D, L. L. LACHAT, H. A. HALVORSON, and L. S. PALMER (*Jour. Assoc. Off. Agr. Chem.*, 15 (1932), No. 4, pp. 660-675, fig. 1).—The first part of this extensive report consists of a comparison of 13 slightly different basal rachitic rations for chicks. Of these, the one selected as most satisfactory consisted of yellow corn 59, wheat flour middlings 25, crude domestic casein 12, precipitated calcium carbonate 1, precipitated tricalcium phosphate 1, dried baker's yeast 1, and sodium chloride 1 percent. The inclusion of skim milk or buttermilk in the basal ration resulted in poor growth and considerable delay in the development of rickets. The ration selected gave an excellent growth rate and uniformly low bone ash values at 5 weeks.

Data are given on the bone ash determinations and weight records obtained in the testing for vitamin D by the method selected of 22 samples of products advertised to contain vitamin D for poultry, including 11 cod-liver oils, 4 cod-liver oil concentrates, 2 proprietary feed supplements, and 1 sample each of sardine oil, burbot-liver oil, cod-liver meal, mineral feed concentrate, and cod-liver stearin. Some of the samples conformed quite closely to their advertised content of vitamin D, while others were of lower content than advertised.

Statistical treatment of the data obtained in bone ash determinations on comparable groups of chickens, one carried through a 4-weeks and the other the customary 5-weeks experimental period, is reported with the conclusion that a 4-weeks feeding period with the method as outlined is as accurate as a feeding period of 5 weeks.

Vitamin D in the treatment of acne vulgaris, A. DOKTORSKY and S. S. PLATT (*Jour. Amer. Med. Assoc.*, 101 (1933), No. 4, p. 275).—This preliminary communication reports favorable effects of vitamin D in the treatment of acne vulgaris. In a group of 35 men and women from 17 to 30 years of age treatment was started with a dosage of 10 drops a day of Mead's viosterol in oil 250 D and increased during a period of 2 weeks to 20 drops a day. After from 4 to 5 weeks a 70 to 80 percent improvement was noted in 90 percent of the cases and a 40 to 50 percent improvement in the others. In all cases blood calcium remained normal. On discontinuing the treatment for 2 weeks with 10 subjects selected at random there was a great increase in the number of pustules over that during the period of treatment, while those who continued the treatment showed sustained improvement.

Investigations concerning the relationship between lack of vitamin D and anemia. (The question of anemia as a partial symptom of rickets) [trans. title], H. HAUSS (*Ztschr. Vitaminforsch.*, 1 (1932), No. 1, pp. 26-38).—

This question was approached through a critical review of the literature on the subject and a discussion of original clinical observations and animal experiments, with the conclusion that anemia in rickets should not be considered as a pure avitaminosis or in any case as a disease caused by lack of vitamin D.

The use of metal cages in the study of nutritional anemia, G. B. GERAGHTY, F. A. UNDERHILL, J. M. ORTEN, and R. C. LEWIS (*Jour. Biol. Chem.*, 99 (1933), No. 2, pp. 451-456, figs. 2).—This and the following three papers are in continuation of the series of studies on nutritional anemia noted previously (E.S.R., 68, p. 128). Comparisons are reported of the rate of development of nutritional anemia in rats kept in the specially constructed glass cages used in previous studies of the series (E.S.R., 65, p. 894), in new galvanized iron cages, and in old galvanized iron cages.

Hemoglobin and body weight curves of the animals in the three groups showed no significant differences. Purified ferric chloride added to the milk diet of anemic rats in the old and new metal cages did not cause any regeneration of hemoglobin. It is concluded that galvanized iron wire cages are as suitable as glass cages for nutritional anemia studies.

The effect of feeding green leafy vegetables and cow peas in nutritional anemia, O. SHEETS (*Jour. Home Econ.*, 24 (1932), No. 10, p. 928).—In this progress report in continuation of the nutritional anemia studies at the Mississippi Experiment Station (E.S.R., 66, p. 295), data are summarized on the hemoglobin regeneration induced by various dried, ground vegetables and the hydrochloric acid solution of the ash of these vegetables on rats rendered anemic on whole milk. All of the green vegetables tested, which included mustard greens, turnip tops, collards, spinach, and two varieties of lettuce, had practically the same hemoglobin-regenerating properties. At the end of 8 weeks the average values for hemoglobin per 100 cc of blood for the groups of animals receiving the dried, ground vegetables in quantities furnishing 0.25 mg of iron daily varied from 5.5 to 8.6 g. Dried field peas (cowpeas) were more effective, bringing the hemoglobin content up to within normal range, 13.1 g. Solutions of the ash of the various vegetables were as effective as the dried materials.

Quality studies of therapeutic diets.—II, The nephritic diet, SISTER M. VICTOR (*Jour. Amer. Dietet. Assoc.*, 8 (1932), No. 2, pp. 157-163).—This continues the committee reports of the diet therapy section of the American Dietetic Association noted previously (E.S.R., 68, p. 126). Nephritic diets from 20 outstanding hospitals were analyzed for their nutritive value according to the Sherman standards for calories, protein, vitamins, and minerals, with the following general findings:

The protein content ranged from 20 to 70 g, with 6 of the diets furnishing from 20 to 35, 9 from 40 to 55, and 5 from 60 to 70 g daily. In most of the diets approximately half of the protein was given as milk, eggs, and meat and the remainder in fruits and vegetables and cereal products. The mineral content was found to depend upon the protein content and to be markedly inadequate on diets furnishing less than 40 g of protein. On 40 g a few of the diets were adequate in calcium, but were low in phosphorus and iron. The vitamin content was considered adequate because of generous amounts of vegetables and fruits, butter, and cream.

With these findings as a guide, a diet was planned to furnish 40 g of protein and 1,800 calories. The addition of 300 g of milk to this gave a diet furnishing 50 g of protein and 2,000 calories, and further additions of bread, jelly, sugar, butter, cream, and eggs one furnishing 60 g of protein and 2,500 calories. The first of the three diets is considered to be adequate except for phosphorus, the second barely adequate in phosphorus, and the third adequate in all respects.

The toxic effects of excessive doses of irradiated ergosterol upon young animals, N. B. TAYLOR and C. B. WELD (*Brit. Jour. Expt. Path.*, 13 (1932), No. 5, pp. 403-411, fig. 1).—In order to investigate the apparently greater susceptibility to irradiated ergosterol of growing than of adult animals, several series of feeding experiments were conducted on puppies on different diets and graded doses of irradiated ergosterol. The doses in general were smaller than those used in previous experiments with adults (E.S.R., 69, p. 312), and the administration was extended over longer periods.

A hitherto unrecognized symptom of overdosage of irradiated ergosterol was a disturbance in the motor mechanism of the bowels predisposing to intussusception. This usually supervened early and caused death before other signs of overdosage were apparent. Other symptoms of toxicity were loss in weight, elevation of the serum calcium, and a definite increase in total calcium excretion.

The resistance of individual animals to the toxic effects of irradiated ergosterol was found to vary considerably. In some animals a daily dose less than 10 times the maximal infant dose, considered to be 0.12 cc of 250 D per kilogram, was definitely toxic, while in one case a daily dose 25 times the maximal therapeutic dose was not toxic.

TEXTILES AND CLOTHING

Stiffness produced in fabrics by different starches and sizing mixtures, M. S. FURRY (*Jour. Home Econ.*, 25 (1933), No. 2, pp. 143-149, figs. 5).—Data are reported from the Bureau of Home Economics, U.S.D.A., on the stiffness of fabrics starched with different concentrations of the various starches studied previously (E.S.R., 67, p. 349), on the effect upon the stiffness of the starched fabric of various humidities, and on the effect of added borax and hydrogenated fat alone and combined upon the stiffness produced in fabrics by the various starches. Stiffness was measured by the instrument devised in the Bureau and described in a previous publication (E.S.R., 61, p. 497).

For canna, dasheen, corn, and rice starches there was a gradual increase in the stiffness of the fabric with increase in concentration of the starch paste to a maximum, after which there was a decrease as shown by lower figures for stiffness at a 4.2 percent than at a 3.7 percent concentration. Wheat and potato starches did not show as wide a range in stiffness values or a drop at the 4.2 percent concentration.

As humidity increased from 50 to 80 percent, there was a marked decrease in the stiffness produced by all of the starches. The order of stiffness values for the different starches remained the same, however, except for rice starch. The stiffness value of this starch at 80 percent relative humidity fell below that of corn and potato. The latter showed a slight increase at 65 percent.

Pastes made of 3.7 percent starch with varying amounts of added borax produced increased stiffness with increasing borax to a maximum of 3 g per 14 g of starch. With wheat and corn starch the stiffness increased even beyond this point. Hydrogenated vegetable oil added in the same way produced a gradual decrease in stiffness except in the case of wheat starch, which was not affected. The addition of equal weights of the hydrogenated oil and of borax gave results sometimes slightly above and sometimes below those with borax alone. The only starch showing a marked change was canna, which produced a decided increase in stiffness with the combination of borax and fat.

These findings are thought to support the belief that fat when used with borax in the sizing mixture has little effect on the stiffness of a fabric, but affects its appearance with respect to smoothness, softness, gloss, and color.

Clothing construction, M. C. WHITLOCK (*Illinois Sta. Circ. 407* (1933), pp. 142, figs. 92).—In this manual particular attention has been given to the development of an appreciation of good standards of workmanship in clothing, whether home-made or ready-to-wear, as well as proficiency in the various processes of clothing construction to avoid the "home-made look." "The term 'home-made'", it is stated, "has come to mean two very different things when applied to foods and to clothing. It is paying a high compliment to food to say that it tastes like home-made food, but it is considered a sharp criticism to say that a dress looks home-made."

HOME MANAGEMENT AND EQUIPMENT

Economic problems of the family, H. KYRK (*New York and London: Harper & Bros., 1933*, pp. XX+500).—This text "is designed to furnish a general background for more intensive work in the field of consumption and of consumer-buying." It includes chapters on the modern American family, the economic history of the family, household production today, economic aspects of household production, the economic position of home-keeping women, have home-keeping women a full-time job, the family income today, contributions to the money income, causes and results of gainful employment of married women, the control of the purse, the adequacy of money incomes for family support—its determination, the adequacy of money incomes for family support—its extent, the risks of disability, unemployment, and old age, provision for the future, social insurance, the purchasing power of the dollar, special price problems of the present day, how family incomes are spent, setting the standard of living, budgeting and account-keeping, other financial policies, buying problems of the consumer, and the improvement of buying. Each chapter is followed by suggested readings.

Determination of standards for the establishment of household budgets for the expenditure of money, time, and energy, H. W. ATWATER ET AL. (*Jour. Home Econ.*, 24 (1932), No. 12, pp. 1047-1052; 25 (1933), Nos. 1, pp. 9-12; 2, pp. 109-114).—This paper, which was prepared by a committee of the American Home Economics Association for presentation at the Fifth International Management Congress, Amsterdam, July 1932, presents a brief picture of the more significant contributions made in the United States toward the determination of standards for the establishment of household budgets in money, time, and energy, with suggestions for further research in this field.

Kitchen arrangement studied by photo-electric eye, L. STANLEY (*Jour. Home Econ.*, 25 (1933), No. 2, pp. 126-128, fig. 1).—This is a brief note calling attention to the practicability of the photo-electric eye as a recording instrument in studying the efficiency of household arrangement. Preliminary studies conducted in the kitchens of eight homes of families varying in size from 4 to 6 persons are described. In these studies the instrument was so placed that only actual trips to the sink itself were recorded. In commenting upon these trial studies, the author expresses the opinion "that the device should be very useful as a recording instrument in studying the efficiency of kitchen arrangement. It furnishes definite data hitherto unavailable in such studies, and used in controlled situations should make possible more definite conclusions as to the comparative efficiency of different arrangements."

Domestic uses of gas, A. E. FORSTALL ET AL. (*Scranton, Pa.: Internatl. Text-book Co., [1932]*, pp. IV+[150], figs. 55).—This is a technical handbook on domestic uses of gas and the design and installation of equipment. It deals with gas lighting, water heaters, cooking appliances, space heaters, gas piping and flues, refrigeration, domestic clothes driers and incinerators, distribution

and use of gas, transmission of gas, distribution of natural gas, comparison with manufactured gas, distribution precautions with natural gas, distribution mains, making joints in mains, metering gas to consumers, reading of gas meters, installing and testing meters, house piping, and utilization of natural gas.

MISCELLANEOUS

Yearbook of Agriculture, 1933, A. M. HYDE ET AL. (*U.S.Dept.Agr. Yearbook 1933*, pp. IV+789, figs. 58).—This contains a discussion of The Year in Agriculture (pp. 1-89) as the Secretary's report to the President, series of articles under the headings of cotton, wheat, feed grains and forage, livestock, dairying, poultry and eggs, fruits and vegetables, and the farm business and the farm home, noted elsewhere in this issue, and agricultural statistics noted on page 744.

Report on the agricultural experiment stations, 1932, J. T. JARDINE, W. H. BEAL, ET AL. (*U.S.Dept.Agr., Off. Expt. Stas., Rpt. Agr. Expt. Stas., 1932*, pp 62).—This report is discussed editorially on page 625.

Report of the Hawaii Agricultural Experiment Station, 1932, J. M. WESTGATE ET AL. (*Hawaii Sta. Rpt. 1932*, pp. [2]+23, figs. 9).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Purpose and benefits of work by the Agricultural Experiment Station, College of Agriculture, University of Illinois (*Illinois Sta. Circ. 408 (1933)*, pp. 28).—This statement of "some of the most obvious benefits and returns" from the work of the station discusses the matter under the heads of conservation of the land resources of Illinois as a continuing source of wealth to the State; reducing production and marketing costs; improving the quality of farm products; adjusting production to demand; and expanding the marketing outlet for farm products.

The Forty-fifth Annual Report of the Maryland Agricultural Experiment Station, [1932], H. J. PATTERSON (*Maryland Sta. Rpt. 1932*, pp. XXVIII+154, figs. 47).—In addition to experimental work previously noted or referred to elsewhere in this issue, this report includes reprints of Bulletins 329-336.

Annual Report of the Massachusetts Agricultural Experiment Station, 1932, F. J. SIEVERS ET AL. (*Massachusetts Sta. Bul. 293 (1933)*, pp. 68).—The experimental work not previously referred to is for the most part abstracted elsewhere in this issue.

NOTES

California Station.—Elizabeth H. Smith, assistant plant pathologist since 1905, was killed in a traffic accident at Berkeley on August 21. She was born in Brookline, Mass., on January 12, 1877, graduating from Smith College in 1900 and receiving the M.S. degree from the Massachusetts College in 1905. She had been associated with many of the station investigations in plant pathology, notably those on diseases of fruits and vegetables.

Colorado Station.—Dr. Herbert W. Reuszer, graduate assistant in Rutgers University, has been appointed associate soil bacteriologist. H. R. Lascelles has been appointed assistant professor of animal husbandry and assistant animal husbandman; R. C. Tom, instructor in animal husbandry and assistant animal husbandman; and Ivan Watson, assistant in animal investigations.

Connecticut College and Storrs Station.—Dr. Charles L. Beach, president from 1908 to 1928 and subsequently president emeritus, died at Storrs September 15, aged 67 years. He was a native of Wisconsin, graduating from the University of Wisconsin in 1886. Ten years later he came to Storrs as instructor in dairying, and continued there as assistant professor and professor and as dairy husbandman in the station until 1906, when he became professor of dairy husbandry and dairy husbandman in the Vermont University and Station. Returning to Storrs in 1908, his long tenure of occupancy of the presidency was notable as a period of marked growth in the enrollment, facilities, and influence of the institution. In recognition of his accomplishments the honorary D.Sc. degree was conferred upon him by Wesleyan University in 1927.

The resignations are noted of E. H. Spaulding as research assistant in animal diseases, T. A. Lyons as instructor and assistant in dairy industry, and A. T. Stevens as professor of vegetable gardening. A. M. Porter has been appointed instructor in vegetable gardening and Dr. Nathan L. Whetten, assistant sociologist.

Louisiana Stations.—The station funds available for the ensuing year are now estimated at \$153,000 as compared with \$225,000 in 1932–33. This decrease has necessitated extended furloughs in the departments of agricultural economics, sugarcane investigations, parasitology, plant pathology, and feed and fertilizer control, as well as other adjustments, including some decrease in activities at both the main station and substations.

Maine University.—Dr. Leon S. Merrill, dean of the College of Agriculture since 1911 and from 1914 to 1930 also director of extension, died September 3. He was born in Solon, Maine, on December 22, 1864, and graduated from Bowdoin Medical College in 1889. He received the honorary D.Sc. degree from the university in 1922.

John M. Briscoe, head of the department of forestry since 1910, died August 3. He was born in Pottsville, Pa., on July 22, 1878, received the M.F. degree from the Yale Forest School in 1909, and served with the U.S.D.A. Forest Service from 1909 to 1910.

New Hampshire College.—*Science* notes that M. Gale Eastman, head of the department of agricultural economics and associate dean of the College of

Agriculture, has been appointed dean vice F. W. Taylor, who has been given charge of practical farm projects.

New York State Station.—Dr. D. C. Carpenter, head of the division of chemistry, has been transferred to the division of dairying, where he will be engaged in dairy chemistry research. Dr. Donald K. Tressler has been appointed chief of research (chemistry) and head of the chemistry division, beginning October 1.

Pennsylvania College.—E. Grant Lantz, instructor in farm machinery from 1924 to 1927, died at Omaha, Nebr., on August 12 at the age of 32 years. He was a graduate in agricultural engineering from the University of Nebraska and served as draftsman in agricultural engineering in the extension service of that university from 1921 to 1924.

American Association of Agricultural College Editors.—The twentieth annual meeting of this association was held at the University of Illinois from July 25 to 27, with representatives of 16 States and the U.S. Department of Agriculture in attendance. The customary competition of publications and other informational material was won by the Kansas College, with Cornell University second. Provision was made for the appointment of a research committee to study editorial problems which need investigation, suggest methods of conducting such research, and maintain contact with individuals who are now doing research work of interest to members of the association.

Officers for the ensuing year were elected as follows: President, A. W. Hopkins of Wisconsin; vice president, W. H. Darrow of Texas; secretary-treasurer, G. K. Rule of Maine, and additional members of the executive committee, A. J. Sims of Tennessee and I. G. Kinghorn of Colorado. St. Paul, Minn., was designated as the place of the 1934 meeting.

Proposed Agricultural College and Experiment Station at Tsinghua University, China.—According to the *Christian Science Monitor*, the Chinese Ministry of Education has decided to establish at Tsinghua University at Peiping a modern agricultural school and experiment station. The latter will be located outside the city and will devote special attention to the improvement of wheat and cotton.

Necrology.—In the words of *The Rural New Yorker*, "the recent passing of Dr. W. T. Macoun, Dominion horticulturist for the Canadian Government Experimental Farms, removes an internationally known horticulturist whose contributions in the realm of his profession were significant and extensive." Dr. Macoun, who died on August 13, was born in Belleville, Ontario, on January 27, 1869, and educated at the Ottawa Collegiate Institute. His long service for the Dominion of Canada began in 1893 as assistant to the director and foreman for the Central Experimental Farm. Subsequently he served as curator of the arboretum and botanic garden, then as horticulturist, and since 1910 as Dominion horticulturist. In these capacities he rendered much pioneer service. Especially noteworthy was his work in the improvement of Canadian apples, for which he received in 1929 the Wilder Silver Medal of the American Pomological Society. He had served as president of the American Society for Horticultural Science and as vice president of the American Pomological Society, the Potato Society of America, and the Canadian Society of Technical Agriculturists.

Frank Eric Millen, professor of apiculture in the Ontario Agricultural College and Provincial apiarist since 1916, died July 14 at the age of 51 years. He was a native of England, a graduate of the University of Toronto in 1913, and had served as State apiculturist and instructor in apiculture in the Michigan College and as associate professor of apiculture in the Iowa College.

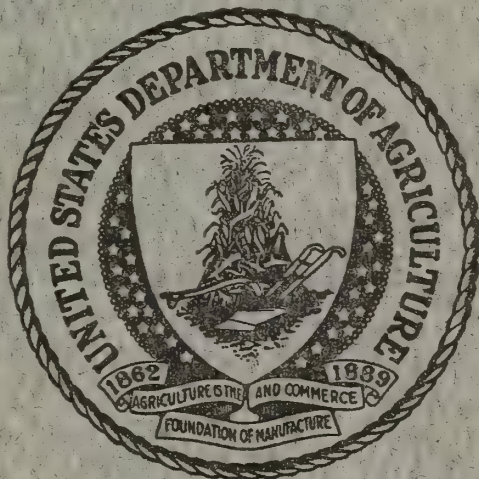
UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS

Vol. 69

DECEMBER 1933

No. 6

EXPERIMENT STATION RECORD



By direction of the Secretary of Agriculture, the matter contained herein
is published as administrative information required for the
proper transaction of the public business

For sale by the Superintendent of Documents, Washington, D.C. - - - - - Price 15 cents
Subscription per volume (2 volumes a year) consisting of 6 monthly numbers and index, \$1.00
Foreign subscription per volume, \$1.50

EXPERIMENT STATION RECORD

Editor: HOWARD LAWTON KNIGHT

EDITORIAL DEPARTMENTS

Agricultural and Biological Chemistry—H. C. WATERMAN, SYBIL L. SMITH.
Agricultural Meteorology—W. H. BEAL.
Soils and Fertilizers—H. C. WATERMAN.
Agricultural Botany, Diseases of Plants—J. W. WELLINGTON, H. M. STEECE,
F. V. RAND.
Genetics—H. M. STEECE, J. W. WELLINGTON, G. HAINES.
Field Crops—H. M. STEECE.
Horticulture and Forestry—J. W. WELLINGTON.
Economic Zoology and Entomology, Veterinary Medicine—W. A. HOOKER.
Animal Husbandry, Dairying, and Dairy Farming—H. W. MARSTON.
Agricultural Engineering—R. W. TRULLINGER.
Agricultural Economics—F. G. HARDEN, B. YOUNGBLOOD.
Rural Sociology—B. YOUNGBLOOD, F. G. HARDEN.
Agricultural and Home Economics Education—F. G. HARDEN.
Foods and Human Nutrition—SYBIL L. SMITH.
Textiles and Clothing—H. M. STEECE, SYBIL L. SMITH.
Home Management and Equipment—
Indexes—MARTHA C. GUNDLACH.
Bibliographies—CORA L. FELDKAMP.

CONTENTS OF VOL. 69, NO. 6

Editorial:	Page
Samuel Fortier, a pioneer leader in studies of farm irrigation practice.....	769
Recent work in agricultural science.....	771
Agricultural and biological chemistry.....	771
Agricultural meteorology.....	775
Soils—fertilizers.....	776
Agricultural botany.....	781
Genetics.....	783
Field crops.....	788
Horticulture.....	798
Forestry.....	808
Diseases of plants.....	810
Economic zoology—entomology.....	824
Animal production.....	838
Dairy farming—dairying.....	848
Veterinary medicine.....	855
Agricultural engineering.....	871
Agricultural economics.....	880
Rural sociology.....	887
Agricultural and home economics education.....	889
Foods—human nutrition.....	889
Textiles and clothing.....	906
Home management and equipment.....	907
Miscellaneous.....	909
Notes.....	910

EXPERIMENT STATION RECORD

VOL. 69

December 1933

No. 6

EDITORIAL

SAMUEL FORTIER, A PIONEER LEADER IN STUDIES OF FARM IRRIGATION PRACTICE

The recent death of Dr. Samuel Fortier has directed attention anew to his long and unique service to American agriculture. A Canadian by birth and education, he was engaged for over 40 years in engineering work in the United States closely associated with farm irrigation practice. He had been connected with three of the agricultural colleges of the far West—Utah, Montana, and California—was director of the Montana Experiment Station from 1900 to 1903, and for 27 years was identified with the irrigation work of the Federal Department of Agriculture. Most of this time was spent in administrative charge of studies in the relatively new field of irrigation investigations, and in this capacity he influenced materially irrigation practice both in the United States and abroad.

The selection of Dr. Fortier in 1907 as chief of the irrigation investigations in the Office of Experiment Stations marked the beginning of a new era in the development of this activity. The investigations of the Office had already been in progress for 10 years under the able direction of Dr. Elwood Mead, and had been responsible for much improvement in agricultural legislation, the organization of irrigation enterprises, and irrigation practice, but much still remained to be done. "The greatest field for future usefulness," declared Mr. R. P. Teele in 1908 in a summary of the past decade's accomplishments, "seems to be in working out methods of checking the large losses of water under present practice and in supplying to settlers in irrigated regions such practical information as will enable them to avoid the losses incident to learning a new system of farming."

Dr. Fortier was well qualified by temperament and training for leadership toward both these objectives. He was an engineer of recognized standing, and as early as 1896 had been awarded the Gzowski medal of the Canadian Society of Civil Engineers for a paper on storage reservoirs. He became a leading authority on irrigation, and his textbooks on the use of water in irrigation, published in 1915 and 1916, took immediate rank as standard treatises. He soon achieved distinction as an organizer and administrator, and

under his guidance the investigations of the Office and its cooperative relationships with the States were developed to a high degree of efficiency and productiveness.

Much of this success may be attributed to his personal qualifications. He had high ideals of research and stood firmly for the selection of fundamental problems for study, the development of adequate methods of inquiry, the thorough verification of results, and the cautious but constructive formulation of helpful recommendations. His leadership was also notable for its breadth of view, envisioning both the technical knowledge of the engineer and a sympathetic understanding and appreciation of the human relations involved in the application of his results by the individual farmer, working under pioneer conditions with limited resources and other handicaps.

From the standpoint of irrigation research, Dr. Fortier made an especially notable contribution in organizing and interpreting the results of investigations relating to the more exact determination of the "duty of water" in terms of plant requirements under different conditions and how these may be met with least waste of irrigation water. For example, in work planned and directed in cooperation with the California Experiment Station on the wilting point of plants as an indicator of water needs, a basis was laid for more efficient use of irrigation water and large savings in the cost of irrigation. Another noteworthy project with which he was associated was the equipment at the Colorado College and Experiment Station of a hydraulic laboratory at which cooperative experiments were carried on regarding the flow of water, water measurement, and related problems.

His services with the Office of Experiment Stations continued, aside from an interval in 1912 as advisor to the government of British Columbia on irrigation law and its administration, until the transfer of the irrigation investigations to the Bureau of Public Roads of the Department in 1915, and thereafter with that organization until his retirement in 1930. Five years earlier, however, he had relinquished administrative duties to devote his time to research and the publication of accumulated material. From 1924 to 1931 he was also consulting professor of irrigation investigations and practice in the University of California. He died in Berkeley, Calif., on August 17, 1933.

Dr. Fortier was born in 1855. At that time land settlement in this country was essentially confined to the humid regions. When he died, settlers upon lands dependent on irrigation for crop production were numbered by the hundreds of thousands and the value of their products by millions. In this great transition he had a substantial part and exerted an influence which was sympathetic, dependable, and constructive.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Biochemical work of the Wisconsin Station] (*Wisconsin Sta. Bul.* 425 (1933), pp. 135, 136).—The discovery of a stimulative substance useful in the production of butyl alcohol, by E. L. Tatum, E. B. Fred, and W. H. Peterson, and some significant results of research on valuable mold products, by Peterson, Fred, L. M. Pruess, H. C. Greene, R. C. Houtz, and A. G. Norman, are briefly discussed.

[Production of butanol, acetone, and ethanol from molasses] (*Puerto Rico Dept. Agr. and Com. Sta. Ann. Rpt.* 1932, Spanish ed., p. 33).—Butanol, acetone, and ethanol were obtained from molasses by the use of a native type of *Clostridium acetobutylicum*.

Chemical investigations of the tobacco plant.—IV, The effect of the curing process on the organic acids of tobacco leaves, H. B. VICKERY and G. W. PUCHER (*Connecticut State Sta. Bul.* 352 (1933), pp. 645–685).—This bulletin reports upon further researches (E.S.R., 68, p. 148), of which the results are largely confirmatory of those recorded in Bulletin 323 (E.S.R., 65, p. 9). "Some of the newer results, however, are at variance with the conclusions of that bulletin. This is due to many improvements that have been introduced into the technic, and to a wider experience with the problems presented. All that can be hoped for is that a closer approximation to the truth has now been obtained." The present data were obtained from three samples of mature Connecticut shade-grown tobacco leaf, each 50 kg, picked on the same day. One of these was immediately extracted with boiling water and the extract prepared for analysis, the other two were submitted to the curing process, one for 12 days, or until the leaves had become yellow, the other for 51 days, or until curing was complete.

It was found in part that "during the curing process the quantity of malic acid in the tissues diminishes. The change is, however, of a minor nature, only about 16 percent of the original amount of this acid being utilized in the katabolic processes. On the other hand citric acid increases nearly sixfold in the same time. The origin of the citric acid thus synthesized is discussed, two possibilities, the carbohydrate, or the unknown acids of the leaves, being suggested; a protein origin of the synthesized citric acid is improbable. Oxalic acid changes very little during curing. Evidence is presented to show this acid occurs largely in the form of insoluble oxalates; this may account for its failure to share to any important extent in the metabolism.

"The total acidity, the acidity in the form presumably of monobasic acids, and the acidity in the form of acids precipitable as barium salts by 60 percent alcohol all changed very little, if at all, during curing. On the other hand the quantity of acids of unknown composition diminished greatly, their place being taken by citric acid. The curing process thus results in a very extensive simplification of the organic acid picture. Only 64 percent of the acidity of the fresh leaves can be accounted for in terms of known acids, chiefly malic,

citric, and oxalic. More than 81 percent of the acidity consists of these three acids after only 12 days of curing, and a similar high proportion was identified in the fully cured leaf."

Detailed directions are given for the determination of the three main acids of tobacco leaves and for the preparation of derivatives whereby these acids can be positively identified.

Changes occurring during freezing storage and thawing of fruits and vegetables, M. A. JOSLYN and G. L. MARSH (*California Sta. Bul.* 551 (1933), pp. 40, figs. 6).—Factors affecting rates of temperature change, degree of change in volume during and after freezing, and chemical changes taking place during freezing storage are reported upon.

Of chemical changes induced by this process, it is noted in part that there was but little loss in pectin by hydrolysis by naturally occurring enzymes in berries, but an appreciable inversion of sucrose was found. This was confirmed in investigations with pure invertase. Fruit exposed to air during freezing or during or after thawing darkened, discolored, and developed unnatural flavors when active oxidases were present. It was found impossible to inactivate the oxidases by heat without destroying the delicate fruit flavors, and permanent inhibition of oxidase by means of acid or reducing agents such as sulfur dioxide affected the flavor of the fruit adversely to some degree. Oxidative changes in vegetables resulted in the development of unnatural haylike flavors. It was found that the development of these flavors could be inhibited and the flavor and color of the vegetable improved by blanching in steam or boiling water. Changes in flavor due to reactions other than oxidation also occurred on prolonged storage. "The development of benzoaldehyde flavor in peaches and cherries and of off flavors, probably due to anaerobic respiration, were especially noticeable."

A new method and instrument for the quantitative determination of chlorophyll, R. E. OLTMAN (*Plant Physiol.*, 8 (1933), No. 2, pp. 321–326, figs. 3).—Light from a 6-v lamp, rheostat-controlled, is passed through a red glass color filter, which converts it into those wave lengths most strongly absorbed by chlorophyll. The chlorophyll, as the water-soluble potassium salt, is contained in a small glass absorption cell. The filtered light passes through the absorption cell containing the sample to be determined and falls upon the face of a photo-electric cell. The intensity of light transmitted is measured by means of a micro-ammeter, whose readings are an exact indication of the amount of chlorophyll present. By calibration of the instrument with known solutions, the calibration curve is found to be a hyperbola with equation $xy=4$, where x is relative light transmitted and y is grams of chlorophyll per 100 cc. The method eliminates personal errors prevalent in colorimetric and spectrophotometric methods and allows detection of much smaller differences in concentration.—(*Courtesy Biol. Abs.*)

Narcotine and the antiscorbutic vitamin [trans. title], O. RYGH (*Ztschr. Vitaminforsch.*, 1 (1932), No. 2, pp. 134–138).—This is a brief summary of the author's theories concerning the relationship of narcotine to vitamin C (E.S.R., 67, p. 648).

Absorption spectrum of vitamin A at low temperatures, F. P. BOWDEN, S. D. D. MORRIS, and C. P. SNOW (*Nature [London]*, 131 (1933), No. 3312, pp. 582, 583).—Attention is called to the fact that at low temperatures the absorption spectra of many molecules show structural details not visible at atmospheric temperature. In carotene dissolved in ethyl alcohol the visible bands at 4,790, 4,440, and 4,200 Å become sharper and are displaced to 4,990, 4,670, and 4,350 Å, and a fourth band appears at 4,060 Å. With the use of this

method of analysis it has been found possible to discriminate between vitamin A and the product giving a band near, but not exactly at 3,280 Å obtained by irradiating the carotene with the mercury line Hg 2,650 (E.S.R., 67, p. 500). When concentrates of vitamin A are cooled to the temperature of liquid air, the maximum at 3,280 is displaced to 3,350 Å, and new bands are developed at 2,900, 2,770, 2,580, 2,510, and 2,430 Å. The product obtained by irradiating carotene on cooling in like manner gives a series of bands at 3,780, 3,570, 3,410, and 3,210 Å. "The more precise spectroscopic test, therefore, shows definitely that the molecule produced by irradiating carotene is different from that associated with the band at 3,280 Å in vitamin A concentrates,"

An inhibitor of the antimony trichloride test for vitamin A in cod liver oil, A. EMMERIE (*Nature [London]*, 131 (1933), No. 3306, p. 364).—Attention is called to previous observations that traces of substances like furan, indole, and skatole inhibit strongly the intensity of the absorption band of vitamin A with antimony trichloride at 620 mμ (E.S.R., 67, p. 501). On the theory that there must be such an inhibitor in cod-liver oil, inasmuch as the color reaction is much stronger with the unsaponifiable fraction than with the original oil, attempts were made to isolate the inhibitor. After various failures success was achieved by saponifying the cod-liver oil, acidifying it, dissolving the mixture of acids in 5 volumes of petroleum ether, drying with anhydrous sodium sulfate, and shaking vigorously with $\frac{1}{10}$ volume of diluted sulfuric acid. On pouring the sulfuric acid layer into a large volume of cold, saturated sodium sulfate solution, extracting the mixture several times with petroleum ether, and evaporating the solvent, the inhibitor remained as an oil which was purified by distilling, dissolving in petroleum ether, and again shaking out with sulfuric acid. The purified substance is said to be a pale yellow viscous oil of molecular weight 332 and empirical formula $C_{21}H_{36}O_3$. It has an inhibiting power from 4 to 5 times as great as indole, and with a platinum catalyst absorbs about 4 atoms of hydrogen per molecule, with loss of inhibiting power.

Ascorbic acid from iris and other plants by a simplified method, E. J. BAUMANN and N. METZGER (*Soc. Expt. Biol. and Med. Proc.*, 30 (1933), No. 9, pp. 1268-1272).—A detailed description is given of a comparatively simple method of obtaining ascorbic acid from plant material. With this method the authors have obtained from 5 to 20 g of ascorbic acid at a time from the leaves of the German iris (*Iris germanica*) throughout the entire season, the leaves of skunkcabbage (*Symplocarpus foetidus*) gathered during April and May, and sweet green peppers purchased from January to May.

The method involves several steps developed by King and his associates in extracting crystalline vitamin C from lemons (E.S.R., 67, p. 650), with attention to observations of Nelson (E.S.R., 68, p. 434) that in the presence of traces of copper ascorbic acid is rapidly oxidized, and to unpublished observations of Marine that ferric iron acts similarly though to a less degree. The ascorbic acid is finally isolated as the monoacetone derivative described by Vargha (see below). From the iris about 70-75, from skunkcabbage leaves 35, and from sweet green peppers 60 percent of the reducing substances originally present were obtained as the crystalline acetone derivative.

The German iris leaves were found to have a concentration of ascorbic acid of 600 mg per 100 g of the fresh leaf in early spring and 250-300 mg per 100 g in the late summer. The skunkcabbage and green peppers both had a content of between 100 and 200 mg of ascorbic acid per 100 g.

Triphenylmethyl derivative of vitamin C, L. VARGHA (*Nature [London]*, 131 (1933), No. 3306, p. 363).—This derivative was prepared by dissolving 1 g of ascorbic acid in 5 cc of pyridine, adding 1.4 g of triphenylchloromethane, and

allowing the solution to stand for two days at 30° C., after which it was evaporated in vacuo, the sirupy residue dissolved in a little benzene, and precipitated with gasoline. A further purification was effected by grinding the precipitate in a mortar under 2 percent acetic acid, drying, and reprecipitating from benzene as before.

The substance, which is described as a white amorphous powder soluble in chloroform, benzene, alcohol, and alkali, insoluble in ether, and practically insoluble in water and gasoline, has a chemical composition corresponding closely to an empirical formula of $C_{25}H_{22}O_6$. The monoacetone ascorbic acid did not give a propyl derivative. "It follows that vitamin C contains a primary OH group which is involved in monoacetone ascorbic acid in the formation of the isopropylidene group. Owing to the presence of a carboxyl group, we may also conclude that vitamin C is not an aldehyde and the CO group is present as ketone."

Vitamin C and ascorbic acid, A. L. BACHARACH (*Nature* [London], 131 (1933), No. 3306, p. 364).—This is a brief note to the effect that the chemical determination of ascorbic acid in Ostomalt, a proprietary product consisting primarily of a mixture of malt solids, concentrated orange juice, and cane sugar, with certain other vitamin supplements, gave results in substantial agreement with determinations of the vitamin C content by biological methods. This is thought to afford further confirmation of the identity of vitamin C and ascorbic acid as summarized by Birch et al. (E.S.R., 69, p. 169).

Preparation of vitamin C from lemon juice, W. A. WAUGH, O. A. BESSEY, and C. G. KING (*Soc. Expt. Biol. and Med. Proc.*, 30 (1933), No. 9, pp. 1281-1283).—A modification of the original method of isolating crystalline vitamin C from lemon juice (E.S.R., 67, p. 650) is described in detail, with the comment that the new procedure can be followed more readily, with larger yields, and in less time. In addition to detailed directions for every step in the process, a note is added calling attention to certain precautions that must be taken to insure success. It is stated that working with from 1 to 6 l of lemon juice consistent yields of from 100 to 150 mg per liter of the crystalline vitamin may be obtained regularly.

The constitution of vitamin C [trans. title], F. MICHEEL and K. KRAFT (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 215 (1933), No. 3-4, pp. 215-224).—This is the detailed report of an investigation noted previously from preliminary reports (E.S.R., 68, p. 170).

Observations on the bone ash method of determining effectiveness of vitamin D supplements, J. L. ST. JOHN, C. KEMPF, and L. BOND (*Poultry Sci.*, 12 (1933), No. 1, pp. 34-36).—Because of the variations that exist in the method for the determination of the value of vitamin D supplements by means of bone ash analyses, the Washington College Experiment Station undertook a study of the methods used.

No difference in the percentage of ash could be detected in bones analyzed at once and those analyzed after 2.5 months' storage in a drying cabinet maintained at a temperature of $65 \pm 2^\circ$ C. Based on the results of the study, the following procedure is recommended for ash determinations: Remove flesh and connective tissue from the tibia, wipe the bone clean with crenolin, and rub off the proximal and distal cartilages; after drying in a steam-heated drying cabinet at $65 \pm 2^\circ$ for 24 hours, extract the bones in a Soxhlet extractor with 95 percent alcohol for 48 hours, turning the bones end for end after 24 hours; dry the bones in a beaker on a steam bath, crush and place in weighed crucibles, dry in an oven at 100° to constant weight, and cool in a desiccator; and ash the bones in a muffle furnace, starting with the furnace

cold and gradually increasing the temperature to 650° for 3 hours or until a white ash is obtained. The ash can then be weighed and the percentage calculated of a dry, fat-free bone.

Photographic records of vitamin D line tests, H. STEVENS and E. M. NELSON (*Indus. and Engin. Chem., Analyt. Ed.*, 4 (1932), No. 2, pp. 200, 201, fig. 1).—This contribution from the Bureau of Chemistry and Soils, U.S.D.A., describes a rapid and economical method developed by the authors for obtaining photographs of vitamin D tests. "The photographs reproduce well either in half-tone or lantern slides, and they enlarge satisfactorily to several diameters. The procedure described can be successfully followed with little practice, and satisfactory records may be rapidly produced by technicians with little knowledge of the principles of photography."

Photographic recording of line tests for vitamin D, A. L. BACHARACH, E. ALLCHORNE, V. HAZLEY, and S. G. STEVENSON (*Indus. and Engin. Chem., Analyt. Ed.*, 5 (1933), No. 1, pp. 12-14, figs. 6).—A photographic method for keeping permanent records of vitamin D line tests, developed independently of the method described by Stevens and Nelson, noted above, and differing from it in a number of details but not in general principles, is described in order of the successive stages of procedure.

Photography as a help in the examination of cattle foods: Structure of the pod and seeds of *Canavalia* spp., M. N. LUCIE-SMITH (*Jour. Southeast. Agr. Col., Wye, Kent*, No. 32 (1933), pp. 42-48, pls. 2).—The author gives descriptions and uses of four species with details of the histology of pods, seeds, and embryos. The points of diagnostic importance are said to be character and length of palisade cells, scattered thick-walled sclerenchyma and "star cells" with brown contents in hilum region, the several layers of column cells and the transition from column cells to parenchyma, and the "porous" cells of the cotyledon.

AGRICULTURAL METEOROLOGY

Thoughts and suggestions regarding the establishment of a plant weather and climate station [trans. title], E. TAMM (*Fortschr. Landw.*, 8 (1933), Nos. 2, pp. 25-29, figs. 9; 3, pp. 59-61, figs. 8; *abs. in Deut. Landw. Rundschau*, 10 (1933), No. 7, p. 426).—The need for more accurate and complete knowledge of temperature and humidity of the air, wind movement, precipitation, evaporation, soil moisture, and ground water level in the immediate vicinity of the plant is pointed out. Apparatus and technic especially suited to the purpose are described.

The 11-year sun-spot period, secular periods of solar activity, and synchronous variations in terrestrial phenomena, H. W. CLOUGH (*U.S. Mo. Weather Rev.*, 61 (1933), No. 4, pp. 99-108, figs. 7).—Supplementing previous studies (*E.S.R.*, 60, p. 314), it is shown by appropriate statistical processes and criteria that the 11-year sun-spot intervals are "systematic rather than fortuitous." The validity of other sun-spot periods is also discussed, as well as the correlation between solar and terrestrial variations. The author finds consistent variations in the lags of the meteorological events persisting through 1,500 years, which "afford additional proof of the reality of both the solar and meteorological periods."

The bases of estimating hail damage to crops, W. ROHRBECK and O. SCHLUMBERGER (*Die Schätzungsgrundlagen bei Hagelschäden. Berlin: Paul Parey*, 1933, pp. 36, pls. 15).—The extent and nature of hail injury to a great variety of field crops, fruits, and vegetables are discussed on the basis of

observations extending over many years, especially at the Biological Institute for Agriculture and Forestry at Dahlem, Germany. The relation of stage of growth of cereals to hail injury and variations of different crops in resistance to such injury are also discussed.

Monthly Weather Review, [March–April 1933] (*U.S. Mo. Weather Rev.*, 61 (1933), Nos. 3, pp. 61–97, pls. 9, figs. 18; 4, pp. 99–128, pls. 21, figs. 14).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 3.—The Diurnal Variation of Free-Air Temperature and of the Temperature Lapse Rate, by J. C. Ballard (pp. 61–80); The Use of Glass Color Screens in the Study of Atmospheric Depletion of Solar Radiation, by H. H. Kimball and I. F. Hand (pp. 80–83); Conservation of Angular Momentum, or Areas, as Applied to an Airplane En Route to the Pole, by W. J. Humphreys (p. 83); and Tornado at Nashville, Tenn., on March 14, 1933, by R. M. Williamson (pp. 84, 85).

No. 4.—The 11-Year Sun-Spot Period, Secular Periods of Solar Activity, and Synchronous Variations in Terrestrial Phenomena, by H. W. Clough (pp. 99–108) (see p. 775); Persistent Weather Abnormality, by C. D. Reed (pp. 109–112); On the Occasions, or Incidental Causes, of Extratropical Cyclones, by W. J. Humphreys (p. 112); An Unusual Texas Duststorm, March 24–25, 1933, by M. C. Harrison (pp. 113, 114); Haze Condition at New Orleans, La., May 5–9, 1933, by G. L. Canaday (p. 114); and Summary of Sea-Surface Temperature Data for 1932, by G. Slocum (p. 115).

Climatological data for the United States by sections, [January–February 1933] (*U.S. Dept. Agr., Weather Bur. Climat. Data*, 20 (1933), Nos. 1, pp. [202], pls. 3, figs. 2; 2, pp. [212], pls. 3, figs. 2).—These numbers contain the usual brief summaries and detailed tabular statements of climatological data for each State.

SOILS—FERTILIZERS

[Soil work of the Idaho Station] (*Idaho Sta. Bul.* 197 (1933), pp. 15–17).—Experimental work on soil fertility and on alkali reclamation is briefly noted.

[Moses Fell Annex Experiment Farm soil work] (*Indiana Sta. Circ.* 197 (1933), pp. 4–7).—Extending the report of continuous experiments (*E.S.R.*, 67, p. 656), the present circular adds the current year's results in the general fertility test, on the top-dressing of wheat with nitrogen, and on the comparison of various phosphates.

[Soil investigations of the Wisconsin Station] (*Wisconsin Sta. Bul.* 425 (1933), pp. 59–61, 132–135, fig. 1).—The station's observations in this field are briefly summarized under the headings: Phosphates Largely Unavailable to Plants when Soil is Acid, and Modification of Colorimetric Soil Tests Increases Accuracy, both by E. Truog; Potash Fertilizers Fixed in Soil in Form of Muscovite, by N. J. Volk and Truog; Compilation Made of Available Information on Root Nodule Bacteria, by E. B. Fred, I. L. Baldwin, and E. McCoy; and Added Carbon Dioxide Increases Nitrogen Fixation by Legumes, by Fred et al.

[Soil Survey Reports, 1929 Series] (*U.S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.]*, Ser. 1929, Nos. 10, pp. 30, pls. 2, fig. 1, map 1; 11, pp. 41, pls. 3, fig. 1, map 1; 12, pp. 35, fig. 1, map 1; 13, pp. 32, fig. 1, map 1).—Of the four survey reports here noted, No. 10 was carried out with the cooperation of the Idaho Experiment Station, No. 11 with the California Experiment Station, and Nos. 12 and 13 with the Georgia State College of Agriculture.

No. 10. *Soil survey of the Gooding area, Idaho*, F. O. Youngs et al.—The Gooding area occupies 277,760 acres in southern Idaho and consists largely of a gently rolling plain broken by large comparatively recent lava flows.

The soils of this area are classified as 17 types grouped into 8 series, the most extensive classified type being Portneuf fine sandy loam, of which the various phases total 11.1 percent of the total area surveyed. Scab land was found to occur to the extent of 43 percent, with 5.3 percent of rough broken and rough stony land.

No. 11. *Soil survey of the Oceanside area, California*, R. E. Storie and E. J. Carpenter.—The Oceanside area comprises 369,280 acres in San Diego County, near the southwest corner of California. It is a largely mountainous tract with a much dissected coastal plain.

Of the classified agricultural soils of this area, Fallbrook fine sandy loam and Vista sandy loam, covering 12.4 and 9.7 percent, respectively, of the areas surveyed, are the most extensive among 32 types of 28 series. Of 30.6 percent of nonagricultural tracts, the largest group found was that of 24.4 percent of rough stony land.

No. 12. *Soil survey of Hart County, Georgia*, G. L. Fuller.—Hart County, in northeast Georgia, is an area of 167,040 acres, ranging in surface from rugged and hilly, with steep slopes bordering the river valleys and scattered over the granitic areas in the northwest quarter, to strongly rolling or gently hilly over most of the county.

The most extensive of the 12 types of 9 series of soils found was Madison gravelly sandy loam, of which 21.7 percent of the county consists. A further 17.1 percent was assigned to Madison sandy loam, and a mixed phase of Cecil sandy loam amounted to 12.1 percent. Meadow and steep broken land were found to make a total of 10.7 percent of the county.

No. 13. *Soil survey of Worth County, Georgia*, R. Wildermuth et al.—Worth County is an area of 362,880 acres, lying on two plains of slightly different level in southwest Georgia. Six of the 14 soil series are grouped, together with a little more than 16,700 acres of swamp, as ill-drained lands.

Tifton sandy loam, 38.3 percent, is the most extensive of the 19 types listed, Norfolk sandy loam following with 23.2 percent, and Plummer sandy loam with 10.9 percent. The two first named are well drained, the last an ill-drained soil. Swamp, 4.6 percent of the county, is listed unclassified.

[*Soil Survey Reports, 1930 Series*] (*U.S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1930, Nos. 4, pp. 31, pls. 2, fig. 1, map 1; 5, pp. 24, pls. 3, fig. 1, map 1*).—The two surveys noted were carried out with the co-operation, respectively, of the Mississippi Geological Survey and the New Mexico Experiment Station.

No. 4. *Soil survey of Hancock County, Mississippi*, C. Lounsbury et al.—Hancock County, in southern Mississippi, covers an area of 306,560 acres, of which about 60 percent is of ill-drained "flatwoods" topography. "The extreme southern part of the county is marshy and is subject to inundations by tides."

Of the 30 types of 20 series described, Norfolk fine sandy loam, 20.1 percent, is the only soil of large extent, with unclassified tidal marsh, 9.2 percent, next in order of areal extent.

No. 5. *Soil survey of the Rincon area, New Mexico*, A. T. Sweet and E. N. Poulson.—The Rincon area includes 56,960 acres of lands consisting mostly of a nearly level alluvial plain along the Rio Grande.

Six series inclusive of 13 types of soils are listed, Gila very fine sandy loam amounting to 23.7 percent, Anthony gravelly sandy loam 15.5 percent, and Pima silty clay to 12.5 percent.

Survey of the physical features that affect the agriculture of the Kona district of Hawaii. H. A. POWERS, J. C. RIPPERTON, and Y. B. GOTO (*Hawaii Sta. Bul.* 66 (1932), pp. 30, pl. 1, figs. 6).—This district, on the western coast of the Island of Hawaii, lies on the western slopes of two young volcanoes. "The country rock is erupted material of basaltic composition, either lava flows or fine-grained, unconsolidated ash. The flows are of two main types, a-a and pahoehoe, showing respectively a rugged, clinkery surface and a smooth, relatively continuous surface. The lavas and ash beds are so permeable that surface water disappears immediately by underground drainage and forms no permanent surface streams. Consequently, there has been very little removal and practically no mixing and redeposition of the surface materials. Chemical weathering has completely altered the ash, but has had little or no effect on the lavas.

"Geologic factors rather than weathering are thus the determining influences in soil formation in Kona, and because of this fact the ordinary scheme of soil classification is not applicable." The classification is therefore based on the depth of ash mantle and the surface texture and type of the underlying lava.

The report divides the district into eight regions, presenting a detailed account of the soil types of each. Sections dealing with coffee are noted on page 806.

[**Illinois soil reports**] (*Illinois Sta. Soil Rpts.* 54 (1933), pp. 27, pls. 2, figs. 6; 55, pp. 35, pls. 3, figs. 9).—The two reports here considered continue the series previously noted (*E.S.R.*, 67, p. 506) and include the usual data regarding the chemical composition of the soils surveyed. The "place-name" system of nomenclature has been adopted.

No. 54. *Ford County soils*, R. S. Smith, E. E. DeTurk, F. C. Bauer, and L. H. Smith.—Ford County occupies an area of 306,982 acres in a region of low relief, has two systems of morainic ridges, and lies in northeastern Illinois. Drainage has been made effective where necessary by the construction of dredge ditches.

The survey indicated the presence of 13 types of as many series, the extensive classifications being those of Elliott silt loam, found to occupy 37.68 percent of the area, Drummer clay loam 28.17, and Clarence silt loam 17.28 percent. The only unclassified material was muck, amounting to 0.14 percent.

No. 55. *Jackson County soils*, E. A. Norton, R. S. Smith, E. E. DeTurk, F. C. Bauer, and L. H. Smith.—Jackson County, possessing an area of 375,475 acres, is located on the Mississippi River in southwestern Illinois. It has a hilly section along the river and in the southern part and is comparatively level in its northeastern section.

Four phases of Ava silt loam cover 43.62 percent of the area surveyed, Bluford silt loam occupying a further 9.42 percent. Rough stony land, 1 percent, and other unclassified areas amount in all to but 2.59 percent.

Agricultural land classification and land types of Michigan. J. O. VEATCH (*Michigan Sta. Spec. Bul.* 231 (1933), pp. 51, figs. 13, map 1).—"It is the purpose of this bulletin to contribute to the knowledge of the land resources of Michigan by outlining and describing the types of land and further to present an economic classification of the types in terms of potential agricultural use, which in turn may be of service to governmental administrators and individuals interested in land planning and land utilization. The major land types of the State, according to present studies, can be embraced in 10 or 12 divisions. Each of these is capable of further division to any degree for which there is scientific and practical need. The major and minor types are briefly described and partly illustrated . . . and the economic classification presented in sequence."

Soil reconnoissance of Montana.—Preliminary report. L. F. GIESEKER (*Montana Sta. Buls.* 273 (1933), pp. 51, pls. 4, fig. 1; 274 (1933), pp. 53, pls. 4,

fig. 1).—The two reports here noted, recording a reconnoissance survey of three counties, are based upon work carried out by the station in cooperation with the U.S.D.A. Bureau of Chemistry and Soils.

Bul. 273. *Soils of Toole and Liberty Counties*.—Toole and Liberty Counties occupy together an area of about 3,370 sq. miles in northwestern Montana, and, with reference to physiographic characteristics, "located in the more shallow drift-covered portion of the Great Plains." The soils form 12 series, containing 22 types, Joplin loam being in each case the one type of important areal extension, 39.4 percent of the area of Toole and 39.7 percent of that of Liberty County.

Bul. 274. *Soils of Glacier County*.—Glacier County, northwestern Montana, occupies 3,045 sq. miles of a "transitional foothill area." The largest single land classification listed is that of mountains, which cover 24.7 percent of the area surveyed. Small areas of 19 series of soils, subdivided into 43 types, were also found, the most extensive being 9.3 percent of Bainville loams.

Porosity and water absorption of forest soils, J. T. AUTEN (*Jour. Agr. Res.*, [U.S.], 46 (1933), No. 11, pp. 997-1014, figs. 10).—Forest soil, in the observations recorded in this contribution from the U.S.D.A. Forest Service, was found much more porous, especially in its upper 6 in., than field soil. Measurement of real specific gravity showed this difference to be more one of soil structure than of organic matter content.

The forest soil absorbed water much more rapidly than did field soil, the absorption being most rapid at a depth of 1 in. There was a gradual decrease with increasing depth. Bare soil absorbed more rapidly at a depth of 3 in. than at the surface.

With adequate forest cover, second-growth soil was found not to lose porosity except in the case of excessive grazing or of destruction of litter by fire. Reforestation of cultivated fields was found to have restored the soil porosity in large measure in the course of from 20 to 25 years.

Soil fertility losses under Missouri conditions, H. JENNY (*Missouri Sta. Bul.* 324 (1933), pp. 10, figs. 6).—The data accumulated in this investigation are considered to indicate that on nonerosive land under cultivation for 60 years soil fertility decreased one third; that losses of soil nitrogen are accompanied by corresponding declines in corn production and land values; that soil nitrogen falls off more rapidly during the earlier periods of cultivation, tending to reach a more or less stable level after several decades; and that the stable nitrogen level is much higher for good than for poor systems of soil management.

The relations of *Bacillus mycoides* with ammonification, nitrification, and soil fertility, M. TYAGNY-RYADNO (*Jour. Agr. Sci. [England]*, 23 (1933), No. 3, pp. 335-358, figs. 7).—According to this contribution from the Institute of Fertilizers and Soil Science of Moskva (Moscow), *B. mycoides* energetically decomposes organic nitrogenous matter, forming large amounts of ammonia. When soil was inoculated with a culture, active ammonification took place and the rate of nitrification was raised. The first effects of inoculation were a parallel development of ammonification and nitrification. Later the rate of ammonification fell off, but nitrifying organisms continued to transform ammonia into nitrate.

The degree of nitrification in chernozem soils is a function of the activity of *B. mycoides*. By creating conditions appropriate to these bacteria, both ammonifying and nitrifying processes are likewise intensified. Fertilization with manure is beneficial not solely on account of the nutrients supplied ad hoc, but farmyard manure is a source of *B. mycoides* and acts similarly to an inoculation with those bacteria. Phosphate rock added to the soil stimulates ammonification and nitrification. These processes in turn produce acid, which assists in making the soil's phosphate reserves available to crop plants. Small

amounts of phosphate rock (0.3–0.5 ton per hectare), together with 5 or 6 tons of farmyard manure per hectare, by intensifying ammonification and nitrification have led to considerable increases in the yields of grain and of leguminous crops, and are deemed the most rational manurial dressings for most of the regions of the U.S.S.R.

A simple and rapid chemical test on plant material as an aid in determining potassium needs, S. F. THORNTON (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 7, pp. 473–481).—A simple and rapid procedure, “found to be a very valuable aid in determining the needs of farm crops for potassium fertilizers”, is described in this contribution from the Indiana Experiment Station. It is based on the extraction of the soluble potassium, its precipitation as the cobaltinitrite, and its colorimetric estimation by comparison either with prepared standards or with a color chart.

The interpretation of the results in terms of potassium supply is based on work on a large number of plats of which the fertilizer and yield histories are definitely known. Data for corn, potatoes, and soybeans from several of the experimental soil fertility farms of the experiment station are given. A good correlation between results of the test and the fertilizer treatments and yield responses is shown.

The availability of phosphatic fertilizers, R. P. BARTHOLOMEW (*Arkansas Sta. Bul.* 289 (1933), pp. 19).—The availability of the phosphorus content of various sources was estimated from dry matter yield and phosphorus absorption.

Superphosphate phosphorus was found more readily absorbed than that of monocalcium phosphate. In acid soils, di- and tricalcium phosphate phosphorus showed an availability of from 80 to 120 percent of that of the phosphorus of monocalcium phosphate, but was not always as effective with respect to dry matter yield.

Limestone and soluble phosphates could apparently be added together to acid soils without serious loss of phosphate availability. Ammoniation up to 6.3 percent did not decrease the availability of superphosphate phosphorus.

The low availability observed in the case of rock phosphate could be improved by adding magnesium sulfate, but not enough to justify recommendation of the mixture for the local conditions studied. The increase in the absorbability of calcium phosphates effected by soluble magnesium salts “is probably the explanation for the greater absorption of phosphorus from superphosphate and ammoniated superphosphates than from monocalcium phosphate.”

The composition and distribution of phosphate rock with special reference to the United States, K. D. JACOB ET AL. (*U.S. Dept. Agr., Tech. Bul.* 364 (1933), pp. 90).—The authors find phosphoric anhydride, lime, alumina, iron, silica, carbonate, and fluorides, together with sulfates (in most samples), to be the main constituents of the commercial phosphate rock deposits of the United States. A number of other elements in small quantities were also usually found. Mainland deposits usually contained from 3 to 4 percent of fluorine; insular deposits, smaller quantities. The fluorine-phosphoric anhydride ratio in a single type of rock was found usually to be approximately constant. On the basis of evidence presented, it is considered that the fluorine content of phosphate rock originates principally from contact of the phosphates with fluorine-bearing waters. The organic matter obtained from phosphate rock was found to contain much nitrogen and sulfur, and the ash of this organic material was found to be rich in iron.

Domestic phosphate rock was found not to contain any significant quantity of phosphorus soluble in neutral ammonium citrate solution, and less than 30

percent of the total phosphorus was soluble in 2 percent citric acid solution. The principal phosphatic component of the mainland deposits was found to be fluorapatite, present almost entirely in a submicrocrystalline condition. Hydroxyfluorapatite was found an important constituent of insular deposits.

A list of 211 citations to the literature is appended.

Commercial fertilizers, H. R. KRAYBILL ET AL. (*Indiana Sta. Circ.* 196 (1933), pp. 16, fig. 1).—This circular contains the usual analytical data, together with tabulations of the average composition and comparative value in dollars per ton of the more common fertilizer components, of classified tonnages of fertilizer sales by 5-year periods from 1883 to 1923, inclusive, and for each year, 1927 to 1932 inclusive, of tonnages of 33 analyses sold each year from 1925 to 1932, inclusive; and of other data indicative of general trends.

AGRICULTURAL BOTANY

The effect of variations in the nutrient media upon the nitrogen, phosphorus, and potassium content on plants, with special reference to the tomato, R. P. BARTHOLOMEW, V. M. WATTS, and G. JANSSEN (*Arkansas Sta. Bul.* 288 (1933), pp. 42).—Analyses of tomato plants grown in sand to which nutrient solutions having a wide variation in composition with respect to nitrogen, phosphorus, and potassium content were added showed that nutrient solutions varying sharply in composition often produce similar results. Apparently under practical conditions wide variations may exist in the nutrient media of plants, and good results, as measured by the amount of dry matter produced, may still be obtained.

However, certain definite growth responses were observed in the several treatments; for example, a limitation in the amount of potassium in the nutrient solution containing an abundance of nitrogen produced a very leafy type of growth. The milligrams of nitrogen, phosphorus, and potassium absorbed by plants receiving all elements essential for growth were controlled to a great extent by the concentration of those elements in the nutrient media. A deficiency of potassium apparently resulted in an increased absorption of nitrogen and phosphorus by the leaves, and a deficiency of phosphorus may increase the absorption of nitrogen by the stems. On the other hand, an abundant supply of nitrogen may increase the milligrams of phosphorus taken up by the leaves of the tomato, and an abundant supply of potassium may increase the absorption of phosphorus by the stems. The absorption of calcium and magnesium did not appear to be significantly influenced by the amount of nitrogen, phosphorus, and potassium absorbed by the plant, but it appeared that their intake was controlled by physiological reactions caused by nitrogen, phosphorus, and potassium.

It is believed that the antagonistic action of elements may take place in the metabolic centers as well as at the surface of the absorbing membrane. The use of percentage composition of a plant in discussing differences in response to nutrient variations is believed of dubious value because it ignores the growth factor which is represented by the amount of dry matter produced. The fact that plants showing unmistakable signs of potassium deficiency actually absorb more milligrams of nitrogen and phosphorus indicates that Liebig's law of the minimum does not apply to fertilization with potassium salts.

Investigations on leguminous bacteria and plants.—XII, The utilization by nonlegumes of the nitrogen compounds effused from root nodules of the Leguminosae [trans. title], A. I. VIRTANEN, S. VON HAUSEN, and H. KARSTRÖM (*Biochem. Ztschr.*, 258 (1933), No. 1-4, pp. 106-117, figs. 3).—Sterile sand

cultures of peas were inoculated with nodule bacteria, and the effused nitrogen compounds were collected. They were composed in the main of amino acids. Rye plants grew normally in sterile sand cultures in the presence of inoculated peas, which indicates that non-Leguminosae can utilize organic nitrogen compounds. The generally held concept that only inorganic nitrogen compounds are of significance for higher plants, therefore, is deemed not justified.—(*Courtesy Biol. Abs.*)

The effect of some chemicals on germination in cocksfoot (*Dactylis glomerata* L.), H. G. CHIPPINDALE (*Ann. Appl. Biol.*, 20 (1933), No. 3, pp. 369–376).—Chemical stimulation (Uspulun, orthophosphoric acid, magnesium sulfate, manganese sulfate, magnesium chloride, copper sulfate, mercuric chloride, lead nitrate, oxalic acid, and sodium chloride) of germination was not obtained. Presoaking in water markedly accelerated germination.—(*Courtesy Biol. Abs.*)

A note on the employment of a mixture of sand and calcium bentonite as the growth medium in pot culture and the establishment therein of a sward of perennial rye grass, A. W. GREENHILL and H. J. PAGE (*Jour. Agr. Sci. [England]*, 23 (1933), No. 3, pp. 329–334).—A mixture of sand and bentonite (after converting it to the calcium clay), containing 6 percent by weight of the latter, was found to be a suitable medium in pot cultures for growth of grass. A good sward of perennial ryegrass was established in the medium by suitable watering, manuring, and cutting of the grass within 11 weeks of sowing. The mixture allowed of easy control of the moisture content and appeared to possess a moisture-retaining capacity comparable with that of a natural soil. The mixture is almost totally deficient in both nitrogen and phosphorus and markedly deficient in potash and in some of the less common elements necessary for plant growth. In view of the above properties and of the buffering action due to the presence of the bentonite, the mixture would appear to be suited to the more general study in pot culture of plant nutrition problems and to offer several important advantages over either sand alone or natural soil for this purpose.

A review of recent work on the effect of ultraviolet radiation upon seed plants, H. W. POPP and F. BROWN (*Bul. Torrey Bot. Club*, 60 (1933), No. 3, pp. 161–210).—In this contribution from the Pennsylvania Experiment Station, recent work is reviewed and a bibliography of 173 titles is appended.

Regeneration in mutilated seedlings, C. D. LARUE (*Natl. Acad. Sci. Proc.*, 19 (1933), No. 1, pp. 53–63).—Regeneration of mutilated seedlings was tested on moist filter paper in petri dishes and on agar made with Shive's solution. Regeneration took place more rapidly on Shive's agar than on the moist paper. Rooting of excised cotyledons was observed in 41 plants belonging to 19 different families. Basal halves of cotyledons rooted almost as rapidly as whole cotyledons, and apical halves were rooted in 10 species. Right and left halves of cotyledons formed roots in 16 species, and smaller fragments of cotyledons rooted in 4 species. Shoots were developed on excised cotyledons in 22 species. Seedlings severed just above the root collar formed new roots at the bases of the severed hypocotyls in 35 different plants belonging to 16 different families. Hypocotyls severed below the cotyledons and above the root collar formed roots in 4 species and shoots in 4 species. In seedlings from which the cotyledons were removed, the plumules failed to develop. Cotyledons and hypocotyls alike form roots in either light or darkness, but some species develop best in the light and others in the dark. The cotyledons and the hypocotyls of a given species may react differently to light.—(*Courtesy Biol. Abs.*)

A special air-chamber for studying photosynthesis under natural conditions, A. J. HEINICKE (*Science*, 77 (1933), No. 2004, pp. 516, 517, fig. 1).—An

apparatus is described for use with leaves having stomates confined to the lower side, in which the air chamber, attached to the lower side only, is a modified glass funnel with a side arm through which air is supplied.

Studies of chemical control of relative humidity in closed species, H. L. SWEETMAN (*Ecology*, 14 (1933), No. 1, pp. 40-45).—Using corked pint bottles as test containers, at 22°, 27°, and 32° C., supersaturated aqueous solutions of each of 10 salts were employed at the Massachusetts State College to maintain air humidity, sufficient solution being used to completely cover the bottom of the bottle. For measuring air humidity a somewhat modified dew point apparatus proved satisfactory. A cog psychrometer is not recommended. The effect of opening the bottle for 2, 5, 15, or 60 minutes and of opening it for 2 minutes and then keeping it closed for 15 minutes was studied. At 22° the relative humidity percentages given when the container air was in moisture equilibrium with the solution of the salt named were as follows: K₂SO₄, 92; ZnSO₄, 83; KBr, 79; NaCl, 75; NaNO₂, 64; NaHSO₄, 63; KNO₂, 63; CaCl₂, 32; KC₂H₃O₂, 25; and LiCl, 12. With KNO₂ troublesome unexplained variations were encountered.—(*Courtesy Biol. Abs.*)

GENETICS

A gene in *Zea mays* for failure of cytokinesis during meiosis, G. W. BEADLE (*Cytologia*, 3 (1932), No. 2, pp. 142-155, pls. 2, figs. 14).—A recessive partially sterile type of corn studied at Cornell University and the California Institute of Technology, named variable sterile (*va*), was characterized by lack of cytokinesis during the meiotic divisions of some of the microsporocytes. Aberrant chromosome behavior often accompanied the failure of cytoplasmic division. Most if not all of the resulting 2*n* and 4*n* cells degenerated, possibly due to these aberrations in chromosome behavior. Variable sterile plants produced largely diploid progeny, indicating again that only the haploid gametes are functional. The *va* gene was located in the *Bn-gl-v₅-ra* chromosome about 10 units to the left of *gl*. See also an earlier note (E.S.R., 67, p. 514).

The genetics of cotton.—Part VIII, The inheritance of anthocyanin pigmentation in Asiatic cottons, J. B. HUTCHINSON (*Jour. Genet.*, 26 (1932), No. 3, pp. 317-339, pls. 2; *abs. in Imp. Bur. Plant Genet. [Cambridge], Plant Breeding Abs.*, 3 (1933), No. 3, pp. 89, 90).—The eighth contribution in this group (E.S.R., 67, p. 227) deals with a series of six multiple allelomorphs controlling the distribution of anthocyanin pigmentation in Asiatic cottons (*Gossypium arboreum*, *G. herbaceum*). These allelomorphs included red (*R*) with anthocyanin distributed throughout the plant; red leaf (*Rl*) with anthocyanin in petal spot, calyx, bracts, stems, and bolls, but not lobe of petal; red calyx (*Rc*) with color in petal spot, calyx, bracts, stems, and bolls, but not in lobe of petal or of leaves; spot (*Rs*) with color in stems and petal spot only; spotless (*ro*) with color in hypocotyl only; and ghost spot (*rg*) with no anthocyanin developed at all and the spot at the base of the petal represented as a blank.

The red, the highest member of the series, was shown to depend for its full expression on the presence of *Y* for yellow corolla. The presence of genes affecting lint length and seed weight was demonstrated in the *R* chromosome. These genes were shown to be responsible for only a small proportion of the variations observed in lint length and seed weight. The *R* series of multiple allelomorphs was found to segregate independently of the *Y* series, and of *A*, one of the two complementary genes for "crumpled."

Meiosis in asynaptic dwarf oats and wheat, C. L. HUSKINS and E. M. HEARNE (*Jour. Roy. Micros. Soc.*, 53 (1933), No. 2, pp. 109-117, pls. 4).—Cytological study on 40-chromosome B-series fatuoid oat dwarfs and on 40-chromo-

some dwarf speltoid wheats in comparison with normal *Avena sativa* and *Triticum vulgare* material provided evidence that asynapsis is produced in certain dwarf wheats and oats through the loss of a specific pair of chromosomes. The lack of pairing is correlated with premature splitting of the chromosome threads and irregular contraction, of which the former is probably primary. The observations are discussed with respect to hypotheses correlating meiosis and mitosis, and remarks are made on the possible bearing of the irregularities in splitting and contraction on the significance of similar occurrences in mammalian tumors.

Study of correlations of branches, flowers, pods, and yield in ground-nut, S. S. MARALIHALLI (*Poona Agr. Col. Mag.*, 25 (1933), No. 1, pp. 24-29).—Observations during three years on Spanish, Japan small, and Strain no. 5—a selection from Spanish peanuts—revealed positive significant correlations of branches per plant with yield, with number of flowers per plant, and with pods per plant; with number of pods per plant and yield; and with flowers per plant with yield and with pods per plant.

A note on the inheritance of seed-coat colour in *Phaseolus lunatus* L., D. RHIND (*Indian Jour. Agr. Sci.*, 3 (1933), No. 2, pp. 360-364, pl. 1).—A gene, *R*, which produces a rose color in the seed coat of some varieties of *P. lunatus*, and an intensifier, *P*, which converts rose into purple but alone is inactive, are described. The speckled pattern is produced by *S*, which breaks up the rose or purple color. It is a partial dominant, causing considerable color suppression when homozygous and much less when heterozygous.

The inheritance of characters in ragi, *Eleusine coracana* (Gaertn.), G. N. R. AYYANGAR (*Agr. and Livestock in India*, 2 (1932), No. 4, pp. 369-379).—Genetic studies with ragi (E.S.R., 69, p. 29) during 7 years are reviewed, with remarks on blooming, anthesis, and crossing, on the inheritance of plant and grain colors, chlorophyll deficiency, sterility, and head shape, and on chromosomes in ragi.

The inheritance of characters in *Setaria italica* (Beauv.).—Part III, Bristles, G. N. R. AYYANGAR, T. R. NARAYANAN, and T. N. RAO (*Indian Jour. Agr. Sci.*, 3 (1933), No. 2, pp. 207-218, pl. 1).—The third part of this series (E.S.R., 68, p. 34) is concerned with the inheritance of the floral structures called bristles.

Bristles in *S. italica* may be grouped as long, medium, short, and dwarf. The dwarf bristle, representing the basic bristle condition in all *Setarias*, is considered due to a factor *X*, while three other factors, *E*, *L*₁, and *L*₂, acting on *X*, are responsible for the four differential lengths. *E* determines the expression of the various bristle types and depends on *L*₂ for its manifestation. *X* with or without *E* remains a dwarf. *L*₁ and *L*₂ contribute to the lengthening of the bristle. Acting individually on the dwarf *Xe*, they produce a short bristle, while together they produce a medium bristle. *L*₁ with *XE* gives a short bristle, *L*₂ with *XE* gives a medium bristle, and *L*₁ and *L*₂ together with *XE* produce a long bristle.

The factors governing bristles and their expression appeared to be independent of those for anther colors and *K*, *B*, and *I* for grain.

Inheritance of waxy endosperm in sorghum, R. E. KARPEN (*Jour. Heredity*, 24 (1933), No. 6, pp. 257-262, fig. 1).—Texas Experiment Station studies made on Batad (P.I.) waxy endosperm sorghum and on crosses between it and the starchy kafir and milo showed that waxy endosperm in sorghum, which stains red with iodine, is inherited as a simple Mendelian recessive. Xenia was displayed in the endosperm starch when recessive waxy flowers were pollinated with starchy pollen. The F₁ endosperm stains blue with iodine. Segregation

was visible in the gametophyte generation of heterozygous plants and red staining and blue staining pollen grains were produced in equal numbers. Definite segregation in the endosperm generation indicated that gametogenesis in sorghum is similar to that of corn. Examination of other material and the studies of others indicated that the waxy type of endosperm in sorghum may be confined to varieties from the Orient, the same general region where this type of endosperm had been found in rice, millet, corn, and Coix.

Observations on the cytology of the sugarcane, N. L. DUTT and K. S. S. RAO (*Indian Jour. Agr. Sci.*, 3 (1933), No. 1, pp. 37-56, pls. 4).—Recent results of a study of fertilization and embryogeny in sugarcane made at Coimbatore are summarized.

The haploid chromosome number was found to be 40 in the Puri, Vellai, and Shamshara varieties, and about 40 in Poovan and Chittan. The Coimbatore form of *S. spontaneum* had 32, and Co. 205, a seedling of Vellai×*S. spontaneum* (Coimbatore), had 56 chromosomes. The size of the nuclei of the microsporocytes was not definitely proportional to the haploid chromosome number.

The pollen tube was found to have reached the embryo sac 7 hours after pollination. The endosperm was seen to be in the coenocytic stage 1 day after pollination, and the division of the egg commenced 2 days after pollination. Two cases of probable parthenogenetic origin of embryos were noticed. A case of polyembryony and an abnormal embryo sac were observed in Vellai×C.A.C. 87. The occurrence of dysploidy in *Saccharum* and the increase in the chromosome number in species hybrids is discussed.

Comparative cyto-genetic studies of tetraploid tomatoes from different origins, E. W. LINDSTROM and L. M. HUMPHREY (*Genetics*, 18 (1933), No. 3, pp. 193-209, figs. 10).—Studies at the Iowa State College of tetraploid tomatoes produced from *Lycopersicum esculentum* and *L. pimpinellifolium* by the asexual, decapitation-callus method showed all the tetraploids to be strikingly similar in certain respects. All bred true to the tetraploid condition, and all showed complete reciprocal sterility with diploid forms of either species. Because the tetraploids bred true and were phenotypically different from their parents, the author believes that tetraploids open a possible way in the origination of new species. The genetic and cytological results of the study suggest that chromosome pairing is not in general governed by mere gene attraction, since unlike chromosomes apparently paired at diakinesis.

The occurrence of unpaired chromosomes in hybrids between varieties of *Triticum vulgare*, L. HOLLINGSHEAD (*Cytologia*, 3 (1932), No. 2, pp. 119-141, figs. 43).—The frequency of pollen mother cells with univalent chromosomes at first metaphase was determined in 5 varieties and 10 varietal hybrids of *T. vulgare* at the Dominion Rust Research Laboratory. The proportion of cells with univalents varied from 2.9 to 9.7 percent, and from 5.2 to 39.1 percent in the hybrids. Hybrids between related varieties usually gave lower univalent frequencies than those between unrelated varieties. In any cell with univalents 2 was the most common number, although as many as 8 were observed. Trivalents and tetravalents were rare. No significant difference in univalent frequency was found in 2 groups of Marquis plants kept under fairly constant temperatures averaging 60° and 77° F., respectively. The univalents in different cells were of different sizes and shapes. It is expected that the occurrence of univalents would give rise in the next generation to plants with abnormal chromosome numbers and to disturbed genetic ratios.

Fruit and leaf characters in inter-specific hybrids of *Prunus*, E. ANGELO and W. H. ALDERMAN (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 115-117).—Observations at the Minnesota Experiment Station during the summers of 1931

and 1932 on seedling plums derived from species crosses showed, contrary to expectation, marked segregation of types in the F_1 generation. Of 302 seedlings of *P. salicina* × *P. americana* 30.5 percent were of the *salicina* leaf type and 27.1 percent of the *americana* leaf type. In the reciprocal cross 56.7 percent were of the *americana* leaf type and 15.8 percent of the *salicina* type, indicating that the percentage of parental types in the progeny of any given cross is strongly influenced by the mother. The practical significance of the results is said to lie in the fact that the plum breeder may secure sufficient segregation in the F_1 without attempting to grow a second generation. The probable rather close relationship of the Japanese and American plums as a factor in the result is conceded.

Somatic segregation in a sectorial chimera of the Bartlett pear, V. R. GARDNER, J. W. CRIST, and R. E. GIBSON (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 11, pp. 1047-1057, figs. 6).—Originally discovered as a limb sport in a Bartlett pear tree growing near Medford, Oreg., this sectorial chimera was found in intensive studies at the Michigan Experiment Station to segregate into further variations which upon propagation and continued selection could be maintained as distinct entities. Not only the fruits but also the young shoots showed a peculiar striping of alternate green and yellow. The leaves were, however, like those of normal Bartlett trees.

Observing certain shoots with wide yellow and very narrow green stripes and others with wide green and very narrow yellow stripes, propagations were made of both and found to carry over the parental characters into the young trees.

Observing that the trees with wide yellow stripes grew very weakly and those with narrow yellow stripes only moderately as compared with normal Bartlett, chlorophyll determinations were made of the bark and showed very low quantities of pigment in the wide yellow-narrow green strain, suggesting that the bark is more important in photosynthesis than commonly believed. In a few cases normal green shoots were observed on striped branches and when propagated yielded normal Bartlett trees.

Observations on the shape of fruit revealed two rather distinct forms, and since no correlation could be established between form and color variations it was manifest that from the original parent limb found in Oregon there had segregated four separate strains, two in color and two in shape.

Morphological and cytological characteristics of triploid pineapples, J. L. COLLINS (*Cytologia*, 4 (1933), No. 3, pp. 248-256, figs. 21).—Following an earlier paper (E.S.R., 66, p. 126) on the existence of triploid forms of pineapples, continued studies revealed a number of additional 75-chromosome plants among variety hybrids and also that the variety Cabezona is so constituted. Based on both genetic and morphological evidence the author concludes that the triploids among the hybrids arose from unreduced egg gametes fertilized by normal haploid pollen. Triploids appeared to be self-sterile, although the diploid hybrids were partially fertile. Pollen of triploids produced a few seed on Cayenne flowers, but the reciprocal cross was unsuccessful. Triploid plants matured more slowly than diploid F_1 hybrids.

Wool inheritance in Hampshire-Rambouillet crossbreds, R. H. BURNS (*Wyoming Sta. Bul.* 196 (1933), pp. 23, figs. 8).—The results of a study of the inheritance of fiber fineness, fleece density, and conformation in Rambouillet and Hampshire sheep and in the F_1 and F_2 crossbreds between them are reported. Measurements were made of the fleece characters in seven body regions, covering $\frac{1}{4}$ sq. in. in each case. The results showed that the fineness and density of the F_1 and F_2 crossbreds were intermediate between the parent breeds. The F_1 s showed an interesting segregation of body and wool characters. A blended type of inheritance was indicated.

The histological structure of the testes in hybrids of the Bactrian camel and Arabian camel (dromedary) [trans. title], G. M. PKHAKADZE (G. PCHAKADZE) (*Trudy Lab. Genet. [Akad. Nauk S.S.S.R.] (Bul. Lab. Genet.)*, No. 9 (1932), pp. 243 249, figs. 4; *Eng. abs.*, pp. 248, 249).—A histological study of the testes of the Arabian camel and the first generation hybrids between the Bactrian camel and the Arabian camel is reported. From the number and character of the sperm present in the crossbreds there seemed to be no reason to indicate the sterility of the hybrids, suggesting that the analogy between the hybrids and the sterility in the mule is erroneous.

Glutathione concentration and hereditary body size.—II, Glutathione concentration in non-nursed young of six populations of rabbits differing in genetic constitution for adult size, P. W. GREGORY and H. GOSS (*Jour. Expt. Zool.*, 66 (1933), No. 1, pp. 155–173).—Continuing this series of studies (E.S.R., 69, p. 509), the glutathione content of new-born rabbits of four breeds and crosses between them, fasted for 48 hours, was found to be in proportion to the mature body weights of the breeds.

The following table gives the average results obtained in the six groups, together with the approximate body size:

Glutathione per 100 g of body weight of rabbits in relation to normal body size

Race of parents	Body size	Glutathione
	Grams	Milligrams
Polish.....	1,660–1,700	29.6±0.7
Angora.....	2,480–3,060	32.9±0.7
Angora × New Zealand Red.....	2,400×4,000	33.3±0.7
New Zealand Red.....	3,000–3,600	33.5±0.7
Polish × Flemish.....	1,900×4,950	34.7±0.6
Flemish Giant.....	4,585–5,000	44.3±0.6

Variations in the adult body size of individuals within a race breeding relatively uniform for size were not associated with the glutathione content. No discoverable differences in the glutathione content of the sexes were noted.

A contribution to the question of breed variability in rabbits [trans. title], B. F. RUMĪANTSEV (B. RUMJANCEV) (*Trudy Lab. Genet. [Akad. Nauk S.S.S.R.] (Bul. Lab. Genet.)*, No. 9 (1932), pp. 235–242; *Eng. abs.*, pp. 241, 242).—Data are tabulated on 19 measurements and proportions in the following breeds of rabbits: White Flanders, Champagne, Alaska, and Silvery-brown. The results indicated that size is determined by factors influencing the growth of the body as a whole. There was no indication of independent inheritance of the size of separate parts of the body.

A search for neurological mechanisms in ovulation, J. C. HINSEY and J. E. MARKEE (*Soc. Expt. Biol. and Med. Proc.*, 30 (1932), No. 2, pp. 136–138).—Several experiments with rabbits have shown that ovulation followed the administration of urine from pregnant women, even after severing the vagal and spinal nerve supply of the ovary.

“Leaden,” a recent color mutation in the house mouse, J. M. MURRAY (*Amer. Nat.*, 67 (1933), No. 710, pp. 278–283, fig. 1).—Two mutant mice described as leaden were produced in the twenty-first generation of a stock inbred by brother-sister or parent-offspring matings. In suitable tests it was found that the mutant gene was not linked with the genes for black, agouti, hairless, naked, dominant spotting, short-ear, albinism, dwarf, or waltzing. An excess of intense brown as compared with dilute brown offspring indicated that postnatal survival was greater in the former class.

Heredity of cancer susceptibility in mice, N. DOBROVOLSKAÏA-ZAVADSKAÏA (*Jour. Genet.*, 27 (1933), No. 2, pp. 181-198, pls. 2).—The hereditary nature of cancer predisposition was confirmed in several strains of mice studied at the University of Paris. The incidence of mammary carcinoma in females of three strains was 52.5 percent as compared with 1.7 percent in another strain. There seemed to be no reason to believe that if cancer incidence is a simple Mendelian character that it is dominant. However, the inheritance of cancer as a simple Mendelian character seemed doubtful. It is suggested that there is probably a general recessive factor for neoplastic growths, with modifying factors for specific types of tumors. This makes the problem of dominance very uncertain. Particular attention is called to the rare occurrence of mammary carcinoma in males, but cancer-free males may be potentially cancerous.

Artificial and hereditary suppression of sacral vertebrae in the fowl, C. H. DANFORTH (*Soc. Expt. Biol. and Med. Proc.*, 30 (1932), No. 2, pp. 143-145).—Eggs were found to produce some rumpless chicks when the incubator temperature was fluctuated during the first week of incubation. Arrested growth rate at a time when the posterior part of the body should be in a state of most active differentiation seemed to be the cause of the development of rumplessness in genetically normal fowls.

The feather of the guinea fowl and a mathematical theory of individual feather patterns, M. HARDESTY (*Jour. Expt. Zool.*, 66 (1933), No. 1, pp. 53-87, pl. 1, figs. 5).—A detailed study of feather pattern formation in the guinea fowl is reported, which indicates that the pattern is essentially predetermined in the feather follicle, although thyroxin injections may modify it. The rates of barb formation and pigmentation reactions were calculated.

Control of the sex characters in the English sparrow, *Passer domesticus* (Linnaeus), W. N. KECK (*Soc. Expt. Biol. and Med. Proc.*, 30 (1932), No. 2, pp. 158, 159).—Castration of the male English sparrow was found to prevent the change to blue-black in the color of the bill during the breeding season. The plumage of capons was of normal male type, and showed no change in the character of the feathers developing after administration of the urine from pregnant women up to 10 rat units of the sex hormone per day for 30 days. The character of the plumage of females was not modified by the removal of the ovaries or the implantation of testes. The daily injections of 2 rat units of the female sex hormone for 9 days stimulated the growth of the oviducts so that they were about one third heavier than normal. It thus appeared that secondary sex characters in the sparrow could be divided into two categories: (1) Those influenced by the gonad secretion, such as bill coloring of the male and oviduct weight in the female, and (2) those under genetical control, such as the male and female plumage.

FIELD CROPS

The design and conduct of field experiments, F. K. JACKSON and Y. D. WAD (*Agr. and Livestock in India*, 3 (1933), No. 3, pp. 211-233, figs. 4).—Systematic organization and simple technic for field experiments are outlined, and devices for labor-saving and convenience are described.

[**Field crops research in Idaho, 1932**] (*Idaho Sta. Bul.* 197 (1933), pp. 24-27, 51, 52, 57, 58).—Agronomic work by the station and substations, again (*E.S.R.*, 68, p. 318) reviewed briefly, comprised breeding work with wheat, sweetclover, red clover, Ladino clover, and reed canary grass; variety trials with wheat, oats, barley, and soybeans; cultural experiments with wheat, reed

canary grass, and alfalfa; crop rotations involving manure and fertilizers; and weed control experiments.

[**Field crops experiments at the Moses Fell Annex Farm, Bedford, Ind.**], H. J. REED and H. G. HALL (*Indiana Sta. Circ.* 197 (1933), pp. 8, 9).—The average acre yields obtained in variety trials with winter wheat, rye, barley, oats, and soybeans for hay and seed, and the yields of spring barley, rye, and wheat are again (E.S.R., 67, p. 667) tabulated for various periods. The response of pasture to fertilizers, lime, and manure is reviewed briefly.

[**Field crops investigations at the Huntley, Mont., Field Station, 1927–30**], D. HANSEN, A. E. SEAMANS, and D. V. KOPLAND (*U.S. Dept. Agr., Tech. Bul.* 353 (1933), pp. 7–22, 25–34, figs. 3).—Experiments in cooperation with the Montana Experiment Station with field crops under irrigation (E.S.R., 62, p. 128), reviewed for the period indicated, comprised crop rotations involving sugar beets, potatoes, oats, corn, wheat, flax, and beans, and designed largely to determine the value of alfalfa, other legumes, and manures when used in rotation; trials of field bean selections and comparisons of irrigated v. dry-land seed; a thinning test with sugar beets; and fertilizer experiments with field beans, sugar beets, and potatoes. Continued research with dry-land crops (E.S.R., 61, p. 724), again reported on by Seamans, included rotation and tillage experiments, involving winter and spring wheat, oats, barley, flax, and corn; variety trials with winter and spring wheat, oats, barley, corn, and potatoes; and a row-spacing test with field beans.

[**Dry-land crop production at the North Platte Experimental Substation, L. L. ZOOK** (*Nebraska Sta. Bul.* 279 (1933), pp. 49, fig. 4).—Experiments in dry-land crop production, made on table land with fertile Holdrege very fine sandy loam in cooperation with the U.S. Department of Agriculture during the period 1906–31, are reviewed, and records of temperature, precipitation, evaporation, and wind movement during the course of the studies are tabulated and discussed. See also earlier notes (E.S.R., 49, p. 527; 55, p. 229). Average acre yields for the period 1912–31 were for corn 22.1 bu., winter wheat 20.3, spring wheat 13.7, oats 31.6, barley 22.3, and potatoes 101.6 bu.

Winter wheat cropped continuously or following other small grain on different seed bed preparations averaged on late plowing 14.7 bu., early disking and late plowing 16.7, disking only 16.9, early plowing top-dressed with manure 17.3, and early plowing followed by clean tillage 20.4 bu. Winter wheat after corn averaged 16.1 bu. when sown without disking, 20.4 when corn was removed and the land disked before planting wheat, and 21.6 bu. after potatoes. Wheat after clean fallow averaged 30.1 bu., after weedy fallow 22.2, after rye for green manure 30.8, and after peas for green manure 29.5 bu. Winter wheat abandoned because of winter-killing amounted to 13.3 percent of the seeded area, the loss ranging from 16.9 percent on late plowing after small grain to 7.5 percent after fallow.

Winter rye from 1921 to 1931 averaged 13.6 bu. per acre on disked barley stubble, on early fall plowing after barley 17.2, on disked corn land 14, and after fallow 30.9 bu. Spring wheat cropped continuously or after other small grain produced 14.3 bu., and on spring plowing 11.9, after corn 12.9, and after fallow 18.7 bu.

Oats cropped continuously or after other small grain produced average (25 years) yields of 24.8 bu. on spring plowing and 28.7 on fall plowing, both after corn, on disking 29.7, on spring plowing 28.5, and after fallow 40.1 bu. Oats following 3 years of alfalfa in a 6-year rotation averaged 20.4 bu., after sorghum in a 3-year rotation 23.8, following rye and peas for green manures 32.9 and 33.6, respectively, and its 20-year average after potatoes was 37.1 bu.

Barley, the most successful spring grain, averaged during 25 years when continuously cropped or after other small grains, on spring plowing 18.9 bu. and on fall plowing 23.9, on disked corn land 19.4, and on fallow 32.6 bu.

Corn after small grain averaged 19.4 bu. on spring plowing and on fall plowing 21.3, continuously cropped 22.3 on spring plowing, 22.5 on fall plowing, 15.6 on fall plowing after sorghum, and 25.7 bu. after fallow. The gains from corn continuously cropped over that in rotation declined as the period of cropping was prolonged. Reduction in stover yield under continuous cropping progressed more rapidly than reduction in grain yield.

Potatoes in 3-year rotations gained in yield but deteriorated in quality as the years of cropping increased. Increased disease infestation as a result of growing potatoes too often on the same land was the cause of poorer quality. Potatoes averaged (20 years) on early fall plowing after oats 103.8 bu., on spring disking after winter wheat 91.6, after fallow 116.7, on early fall plowing after winter wheat 112.9, and on spring disking after corn 79.5 bu.

Milo after corn produced 29.1 bu. and after small grain 26.4 bu., over an 11-year period. Sorgo sown in close drills was very satisfactory as an annual forage, its average yields from each of five rotations exceeding 3 tons per acre. The highest yield was after fallow, but the increase on that preparation was not enough to pay for the added cost.

Relative yield and dependability of crops under High Plains conditions, H. H. FINNELL ([Oklahoma] *Panhandle Sta., Panhandle Bul. 51 (1933), pp. 12*).—Comparative study of six different types of crops grown from 1924 to 1932 in 28 cropping systems at Goodwell, Okla., indicated that four of the crops used were about equal in average acre value of production when each was utilized in the most appropriate manner. Ranked as to relative dependability, these crops were forage sorghum, grain sorghum, annual legume, and wheat. Forage sorghum was produced satisfactorily, either as a closely drilled hay crop or as a row-cultivated bundle feed. Spring grains, e.g., oats and barley grown in various cropping systems, and corn proved to be unproductive and very unreliable compared to better adapted crops. Indications were that an essential feature of reorganizing the High Plains farm for the purpose of stabilizing the flow of production would be the introduction of farm livestock capable of utilizing the dependable crops.

[Field crops experiments at the Puerto Rico Insular Station] (*Puerto Rico Dept. Agr. and Com. Sta. Ann. Rpt. 1932, Spanish ed., pp. 20–22, 31, 32, 41, 42, 43*).—Agronomic investigations reported on briefly from the station and the Isabela Substation included variety, spacing, irrigation, fertilizer, and green manuring experiments, all with sugarcane; fertilizer, irrigation, and burn tests with tobacco; a fertilizer trial with cotton; and trials of varieties of yautia and forage grasses.

Forage crops for central Washington, H. M. WANSEER (*Washington Col. Sta. Bul. 281 (1933), pp. 24, figs. 12*).—Experiments with varieties of cereals, legumes, and grasses for forage, and various production practices, carried on for more or less extended periods under semiarid conditions at the Adams Substation, are reviewed with remarks on climatic conditions, characteristics of the growing season, and difficulties in producing harvestable forage.

The small grains are recommended for producing harvestable forage. Spring wheat should be sown when winter wheat and rye cannot be grown. Field peas and hairy vetch are the most desirable annual legumes, whereas most of the miscellaneous forage crops were unsuccessful. Yields of alfalfa and sweet-clover were poor and stands were hard to obtain. Crested wheatgrass, grown on the station for 14 years, was the most promising grass tried, although quincy

grass is indicated for coarse sandy lands. Crested wheatgrass is winter hardy, starts growth very early in the spring, the stands persist for long periods, and it is well liked by stock. It can be sown with an ordinary grain drill and is recommended for lands on which wheat culture has been discontinued.

[**Field crops investigations in Wisconsin, 1931-32**] (*Wisconsin Sta. Bul. 425 (1933)*, pp. 62-79, 131, 132, figs. 4).—Report is made on the further progress of agronomic research (E.S.R., 67, p. 668), including fertilizer experiments with potatoes, by F. L. Musbach; fertilizer and liming tests with alfalfa and cereals, the value of green manuring crops, comparisons of alfalfa varieties, and fertilizer trials with potatoes, all on sandy soils, and fertilizer and cultural tests with reed canary grass on peat soil, all by A. R. Albert; pasture experiments concerned with premature and delayed grazing, changes in soil reaction through liming in relation to availability of phosphorus fertilizers, relation of nitrogen fertilization to phosphorus fertility and to recovery of nitrogen in grass protein, and the response of bluegrass pasture to mineral fertilizers and lime, all by G. B. Mortimer, E. J. Graul, and H. L. Ahlgren; the effect of fall pasturing or cutting on fertilized and untreated alfalfa which had already received two summer cuttings, and the best time for making the first cutting, both by L. F. Graber; productive cereal crops for northern Wisconsin livestock farms, and development of improved varieties of alfalfa, both by E. J. Delwiche; improvement and yield trials of Ped. 38 barley, by B. D. Leith; the characteristics of abnormal types found in pure cultures of *Rhizobium trifolii*, by L. Almon and I. L. Baldwin; and breeding work and yields tests of corn hybrids, in cooperation with the U.S. Department of Agriculture.

Grasses, alfalfa, and sweet clover at the Archer Field Station, A. L. NELSON (*Wyoming Sta. Bul. 195 (1933)*, pp. 46, figs. 12).—Forage crops experiments made in cooperation with the U.S. Department of Agriculture over various periods since 1913 comprised variety tests with grasses, alfalfa, and clovers, and studies of the influence of tillage and cultural practices, manuring, shelter belts, and rotation on the production of crested wheatgrass for forage and seed, alfalfa, and sweetclover. Climatic conditions during the experimental period and cultural suggestions are also included.

Crested wheatgrass proved better adapted for hay production than other grasses tested, outyielding brome grass both in rotation and old stands. Slender wheatgrass, tall oatgrass, and brome grass produced well for 3 or 4 years, and orchardgrass provided good summer pasture, although yielding less hay than timothy, which withstood drought better. Crested wheatgrass produced more hay when seeded in rows than when drilled, and responded to barnyard manure and moisture from snowdrifts caused by the shelter belt in greatly increased yields, whereas tillage was of little or no value. Mixed stands of crested wheatgrass and alfalfa produced larger hay yields than either seeded alone. Sweetclover surpassed manure for rejuvenating old crested wheatgrass sod. The largest yields of crested wheatgrass seed occurred where the hay production was largest, i.e., next to the shelter belt from new manured stands. Good yields were also made next to the shelter belt on plats where clover had been grown with the crested wheatgrass.

Ladak alfalfa, which produced the largest hay yields, seemed to be the best variety for dry-land farming. Alfalfa yielded more hay in rows, especially the wider rows, than when drilled. The crop responded to manure and to the added moisture resulting from the snowdrifts caused by the shelter belt, but not to disking. Alfalfa did not prove successful in rotation under dry-land conditions, and caused decreased yields of following crops. It should be seeded fairly early in the spring, preferably on row-crop land. Alfalfa production on

dry land appeared to depend largely upon fall and spring precipitation. Inoculation with nitrogen-fixing bacteria was of no value.

Sweetclover produced the largest yields when seeded in rows, but did not perpetuate itself on arable dry land. The crop evidently is adapted to rotations when seeded alone or with a suitable nurse crop. Annual sweetclover and red clover gave little promise, and Korean lespedeza was a failure.

[**Field crops research in India, 1929-31**] (*India [Dept. Agr.] Rev. Agr. Oper.*, 1929-31, pp. 14-88, 107-127, 149-153, pl. 1).—Experiments and breeding work with field crops carried on by the imperial and provincial departments of agriculture in the different divisions of India are reviewed as heretofore (*E.S.R.*, 66, p. 822) for the two years indicated.

[**Statistical notes for agricultural workers**] (*Indian Jour. Agr. Sci.*, 2 (1932), Nos. 1, pp. 28-41; 2, pp. 157-169; 6, pp. 679-709; 3 (1933), Nos. 1, pp. 131-154; 2, pp. 339-352).—This series embraces 11 articles: A Statistical Note on the Method of Comparing Mean Values Based on Small Samples (pp. 28-41), A Statistical Note on Certain Rice-Breeding Experiments in the Central Provinces (pp. 157-169), Auxiliary Tables for Fisher's Z-Test in Analysis of Variance (pp. 679-693), and Rice and Potato Experiments at Sriniketan (Agricultural Department of the Visvabharati), 1931 (pp. 694-703), all by P. C. Mahalanobis; A Note on the Variation of Percentage Infection of Wilt Disease in Cotton, by P. C. Mahalanobis and S. S. Bose (pp. 704-709); The Effect of Fertilizers on the Variability of the Yield and the Rate of Shedding of Buds, Flowers, and Bolls in the Cotton Plant in Surat, by P. C. Mahalanobis (pp. 131-138); The Effect of the Time of Application of Fertilizers on the Yield and the Rate of Shedding of Buds, Flowers, and Bolls in the Cotton Plant in Surat (pp. 139-146), The Effect of Different Doses of Nitrogen on the Rate of Shedding of Buds, Flowers, and Bolls in the Cotton Plant in Surat (pp. 147-154), Certain Varietal Studies on the Cotton Plant in Surat (pp. 339-344), and The Analysis of a Manurial Experiment on Wheat Conducted at Sakrand, Sind (pp. 345-348), all by P. C. Mahalanobis and S. S. Bose; and The Use of the Method of Paired Differences for Estimating the Significance of Field Trials, by P. C. Mahalanobis (pp. 349-352).

Grassland management and its influence on the sward.—Part I, Factors influencing the growth of pasture plants, M. G. JONES (*Empire Jour. Expt. Agr.*, 1 (1933), No. 1, pp. 43-57, pls. 3).—In a study of the effect on the plant of cutting and grazing to various intensities, overgrazing and overcutting markedly restricted the development of the root system and of the succulent leafbase in both young and old-established turfs. During subsequent growth the production of green leaf in winter and spring was greatest when the grazing or cutting had been very light in the previous season.

When sown alone, perennial ryegrass, rough-stalked meadowgrass, and crested dogtail reacted favorably to nongrazing in winter and early spring, but where competition existed, as in a mixture, the success of a species depended largely on the aggressiveness of the other grasses, which in turn were influenced strongly by the times of stocking. Perennial ryegrass, the earliest grass, successfully checked the incursions of Canada thistle, especially when the pasture was rested in winter and early spring, but the two late-starting grasses and wild white clover allowed the weed to establish itself and spread rapidly.

Effect of frequent clipping on the development of certain grass seedlings, J. H. ROBERTSON (*Plant Physiol.*, 8 (1933), No. 3, pp. 425-447, figs. 10).—The development of seedlings of bluegrass, blue grama grass (*Bouteloua gracilis*), junegrass (*Koeleria cristata*), needlegrass (*Stipa spartea*), brome grass (*Bromus inermis*), and Sudan grass, grown in the greenhouse at the University of Nebraska, was studied after each of four clipping treatments.

The growth of tops as measured by dry weight decreased due to clipping, reduction in yield ranging from 80 to 96 percent for the different species. Elongation of tops was stimulated in brome grass, junegrass, and needlegrass, and inhibited in the other species. The width and number of leaves and the number of tillers were reduced by clipping. Removal of the tops invariably retarded root penetration but seldom stopped it completely. Nodal roots, the underground parts affected most, in most cases were nearly absent after the fourth clipping. The greatest reduction in yield, that of brome grass, accompanied the greatest retardation in root development, while minimum reduction in both root and shoot occurred in junegrass. In general, clipping reduced growth of roots, as based on dry weight, about twice as much as that of tops. In the six grasses the roots of clipped plants ranged in weight from one third to one fiftieth as much as those of their controls. The removal of the aerial parts of grass seedlings had an immediately injurious effect, measurable both above and below ground. Degree of injury depended largely upon the nature of the species and the frequency of the treatment.

Range grasses of Hawaii, J. C. RIPPERTON, R. A. GOFF, D. W. EDWARDS, and W. C. DAVIS (*Hawaii Sta. Bul.* 65 (1933), pp. 58, figs. 49).—The nature of growth, palatability, persistence, climatic needs, adaptation, current importance and possibilities in Hawaii, and the chemical composition are discussed for 49 grasses growing on local ranges in the Territory.

Rothamsted experiments on residual values of leguminous crops, H. NICOL (*Empire Jour. Expt. Agr.*, 1 (1933), No. 1, pp. 22–32, figs. 6).—Results of cropping experiments on Hoos field, carried on from 1899 to 1922, inclusive, showed that the effect of preceding crops of legumes could be traced by increased yields of grain (wheat, oats, and barley) for several years after the culture of the legumes had ceased. The residual value of alfalfa was markedly superior to that of red clover, beans, peas, sweetclover, sainfoin, white clover, or vetch.

Autogamous alfalfa, L. E. KIRK and W. J. WHITE (*Sci. Agr.*, 13 (1933), No. 9, pp. 591–593, pl. 1).—Self-fertilizing plants found in a selection of Grimm alfalfa produced pods freely under greenhouse conditions. Pollination occurs in the early bud stage, and tripping the flowers is not essential for fertilization as is usual in alfalfa. A method of rendering petals of alfalfa flowers transparent is described.

The effect of harvesting at different stages of maturity upon the yield and chemical composition of barley, D. M. McLEAN (*Sci. Agr.*, 13 (1933), No. 11, pp. 698–713, figs. 5).—Yield and other agronomic data were determined on barley (O.A.C. 21) grown at the Manitoba Agricultural College during 1930 and 1931 and harvested at brief intervals from complete pollination until several days past maturity, and the nature and extent of variations in the mineral, carbohydrate, and nitrogenous constituents of component plant parts were studied from samples taken daily during the same period.

Neither yield per acre nor weight per 1,000 kernels was reduced significantly by harvesting the barley one week before maturity. The percentage of dry matter of component plant parts fluctuated considerably for different periods, but in general there was a definite increase with approaching maturity. The ash percentage in the leaves and the whole plant samples tended to decrease with approaching maturity, while in the spikes a rise occurred, followed by a period of uniform content up to the eighteenth day, and then a decrease to maturity. In the culms the decrease continued until the twenty-fourth day after heading, followed by an increase to maturity.

A steady decrease in the protein percentage of the leaves and culms took place up to maturity. The spikes decreased in protein content until the kernels were in the soft dough stage, but from then on a slight decrease occurred. The

reducing sugars rose in the leaves up to the firm dough stage and in the culms and spikes to the milk stage, and thereafter declined rapidly to maturity in all three parts. The sucrose content of the culms and heads was at its maximum when the kernels were in the milk stage, or 14 days after heading, and in the leaves about one week before the high point in the culms and spikes. There was a rapid increase in the starch in the spike samples with approaching maturity, while in the leaves and culms an increase was noted late in ripening and desiccation.

Varieties of corn for central Pennsylvania, C. F. NOLL and C. J. IRVIN (*Pennsylvania Sta. Bul.* 289 (1933), pp. 12, figs. 3).—In variety tests of corn for grain from 1909 to 1932, College White Cap, a local strain of yellow dent, and Mifflin County Leaming were outstanding, ripening well nearly every year. Local unnamed strains of White Cap from several counties yielded as high as the foregoing varieties, but matured nearly a week later. In years when it ripened, Sweepstakes yielded high, but it matures too late at the station. Among varieties compared for silage from 1915 to 1931, Lancaster Sure Crop, 100-Day Bristol, and Sweepstakes made nearly the same yields of dry matter and of total nutrients. Eureka produced more green material but a lower yield of nutrients.

What to do if corn must be planted late, G. H. STRINGFIELD (*Ohio Sta. Bimo. Bul.* 163 (1933), pp. 114, 115).—Experience of the station cooperating with the U.S. Department of Agriculture suggests, as a way to avoid large reductions in yield when corn planting is delayed for as long as a month, the use of a variety maturing from 7 to 10 days earlier than locally adapted corn, and the hill application of from about 100 to 150 lb. per acre of 2-12-6 or 0-14-6 fertilizer. Local corn may be used for silage even with greatly delayed planting.

Development and shedding of leaves of cotton, M. AFZAL (*Indian Jour. Agr. Sci.*, 3 (1933), No. 1, pp. 97-115, figs. 6).—In a study of the development and shedding of leaves of cotton, the ages of the cotyledons differed significantly in the four varieties observed. The appearance of the successive leaves on the main stem was affected by the prevailing temperature, but the intervals in appearance of successive leaves on the main stem were not correlated with the length of the internodes. The age of leaves at the time of shedding varied considerably during the season.

The development of flower and pollen in jute, I. BANERJI (*Indian Jour. Agr. Sci.*, 3 (1933), No. 1, pp. 116-126, pls. 2, fig. 1).—The development of the flower and pollen was studied in Chinsura Green jute (*Corchorus olitorius*).

The development of the floral organs in *C. olitorius* and also in *C. capsularis* is centripetal, the sequence being sepals, petals, stamens, and pistil. Corolla growth is arrested at an early stage of development, but resumes when the other floral members have been differentiated. The resting nucleus of the microspore mother cells has a granular reticulum, and the nucleolus generally occupies a central position. A very contracted knot noted in synizesis lies at one side of the nuclear cavity adpressed to the nuclear wall, and the nucleolus is entangled in its meshes. A second contraction stage is noted, and the method of chromosome conjugation is telosynaptic. Each of seven loops counted at this stage is composed of two homologous chromosomes united at the loop's apex. In diakinesis the two members of a bivalent chromosome lie side by side or are arranged in various ways. Heterotypic and homotypic divisions are regular. An interkinetic stage of some duration occurs before the second division begins. The nuclei are well organized, and the homotypic split is

noted in most of the chromosomes at this stage. Cytokinesis takes place by furrowing. The young pollen grains contain a single nucleus situated centrally. The haploid number of chromosomes is 7 and the diploid 14.

Potatoes (*Connecticut Storrs Sta. Bul.* 183 (1933), pp. 8).—Practical suggestions for growing potatoes in Connecticut, made jointly with the Connecticut State Experiment Station and based extensively on research at both stations, deal with varieties, seed treatment, planting, soils and rotations, fertilizers, cultivation, harvesting and storage practices, and control of insects and plant diseases.

The Warba: A new early potato, F. A. KRANTZ and A. G. TOLAAS (*Minn. Hort.*, 61 (1933), No. 7, p. 137).—The Warba potato produced at the Minnesota Experiment Station from a cross between a selected seedling and Bliss Triumph is characterized by earliness, upright vine, high yield, short, round, blocky white tubers with pink eyes, uniform size in hill, few culls, and resistance to mild mosaic. It appears to be well adapted as an early market potato and an early variety for the home garden.

Studies in Indian pulses, III–V (*Indian Jour. Agr. Sci.*, 3 (1933), No. 1, pp. 1–36, pls. 4, fig. 1; 2 (1932), No. 6, pp. 607–624, pl. 1; pp. 625–637, pl. 1).—Three additional papers (E.S.R., 66, p. 630) are presented.

III. *The types of Cajanus indicus* Spreng., F. J. F. Shaw, A. R. Khan, and H. Singh.—This describes and classifies 86 types of pigeonpeas studied at Pusa, and gives information on pollination and morphological characters in *C. indicus*.

IV. *Mung or green gram (Phaseolus radiatus* Linn.), R. D. Bose.—Forty types of mung beans isolated from samples collected in different parts of India are described and classified with remarks on blooming, pollination, and fertilization. Differences between mung and urd beans are indicated.

V. *Urd or black gram (Phaseolus mungo* Linn. var. *Roxburghii* Prain), R. D. Bose.—Twenty-five types of urd beans, isolated from samples from important districts in India and Burma, are described and classified.

Reed canary grass, J. H. CHRIST (*Idaho Sta. Circ.* 71 (1933), pp. 6, fig. 1).—The characteristics of reed canary grass as it occurs in Idaho are described briefly, with suggestions on growing the crop and using it for pasture, hay, or seed production.

Studies in Surma Valley rices and their classification, S. K. MITRA and P. M. GANGULI (*Indian Jour. Agr. Sci.*, 2 (1932), No. 6, pp. 571–606, pl. 1).—The agricultural classes of rice grown in the Surma Valley and morphological characters of the plant and spike are described, correlations between several characters are indicated, and 703 types of rice are classified on the basis of unhusked kernel characters.

Some aspects of the growth of rice in heavy black soils of the Central Provinces, D. V. BAL and R. N. MISRA (*Agr. and Livestock in India*, 2 (1932), No. 4, pp. 404–416, pl. 1).—Mechanical analyses of the light and heavy rice soils of the Central Provinces show that the former possess a lower pH value than the latter. When a heavy soil formerly in wheat was converted into a rice field the lime content in the soil was decreased, with a corresponding reduction in pH value. Experiments in sand cultures with nutrient solutions of different pH values indicated that rice prefers a slightly acidic or neutral medium. In pot and field studies the pH value of the soil was lowered by an adequate application of sulfur. It was evident that in heavy soils receiving a basal dressing of green manure sulfur gives an increased outturn, although decidedly better results came from an annual application of superphosphate, either alone or with sulfur.

The intake of nitrogen by the rice plant (*Oryza sativa* L.), R. H. DASTUR and T. J. MALKANI (*Indian Jour. Agr. Sci.*, 3 (1933), No. 2, pp. 157-206, figs. 4).—The intake of nitrogen in the form of ammoniacal nitrogen and nitrate nitrogen at different growth stages was studied at the Royal Institute of Science at Bombay. Seedlings of Columba variety No. 42 were grown in water culture solutions from germination, and plants at the transplanting stage and from the soil were also kept in culture solutions as a duplicate series.

From solutions of ammonium sulfate, rice at all growth stages absorbed a greater quantity of ammonium ions than sulfate ions, and the solutions became more acidic, but the absorption of ammonium ions decreased with age. The absorption of this ion was independent of other ions, since the same quantity of ammonium ions was absorbed from all solutions used at a particular stage. The absorption ratios of ammonium ions decreased as the plant aged. So far as the absorption of ammonium ion was concerned, ammonium salts stood in the order sulfate, phosphate, nitrate, and chloride in the earlier stages, and sulfate, nitrate, phosphate, and chloride in the later stages.

The absorption of nitrate ion increased as the plant aged. Nonabsorption of nitrate ion from a solution of nitrate did not seem due to the nonabsorption of the positive ion, and the absorption of nitrate ion appeared independent of other foreign ions. The absorption ratios of nitrate ions increased as the plant aged. The absorption of nitrate ions from solutions of different concentrations of salts showed the salts to be in the order of ammonium, magnesium, calcium, potassium, and sodium nitrates in earlier growth stages, and ammonium, potassium, magnesium, calcium, and sodium nitrates in later growth stages.

The greater absorption of ammonium ion at early stages and of nitrate ion at later stages may be attributed to differences in the permeability of protoplasm at the different growth stages. The absorption of nitrogen by the rice plant evidently depends upon the form and upon the growth stage when supplied.

The relation of anther color and the proportions of starch filled pollen grains in the sugar cane, T. BREGGER (*Jour. Dept. Agr. Puerto Rico*, 17 (1933), No. 2, pp. 139-143).—Observations in the course of breeding work at the Puerto Rico Insular Experiment Station revealed that within rather wide limits a positive relationship exists between pollen fertility as indicated by the iodine test and the degree of anther coloration in the sugarcane. Intensity of purple coloration of the anthers is indicative of the fertility of the enclosed pollen grains. Pollen samples taken from dried flowers 9 months after the fresh samples were secured were similar in iodine reaction.

Structure and germination of tobacco seed and the developmental anatomy of the seedling plant, G. S. AVERY, JR. (*Amer. Jour. Bot.*, 20 (1933), No. 5, pp. 309-327, figs. 5).—Indicated as the first of a series of studies on the structure and development of *Nicotiana tabacum*, this paper describes the structure and germination of the tobacco seed and the ontogeny of the primary root, the hypocotyl, and the cotyledons.

The status of wheat breeding in Ohio, C. A. LAMB (*Ohio Sta. Bimo. Bul.* 163 (1933), pp. 101-104).—Methods used in wheat improvement work at the station are outlined, with remarks on problems receiving special study, as winter hardiness, disease resistance, response to soil fertility, and milling and baking quality.

The breeding of early-ripening varieties of spring wheat in Canada, L. H. NEWMAN (*Empire Jour. Expt. Agr.*, 1 (1933), No. 1, pp. 3-16, pl. 1, fig. 1).—The wheat breeding program of the Dominion Experimental Farms is reviewed from its inception in 1888 to the present. The best new varieties produced were in order of appearance Preston, Stanley, Huron, Percy, Early Riga, Alpha,

Bishop, Marquis, Prelude, Ruby, Garnet, and Reward, but only Marquis, Reward, and Garnet are of current importance. The difference between varieties in length of time required to reach maturity has remained fairly constant. Earliness seemed to be inherited similarly to other characters, but rather complex.

The occurrence of water hyacinth (*Eichhornia crassipes*, Solms.) seedlings under natural conditions in Burma, H. F. ROBERTSON (*Agr. and Livestock in India*, 2 (1932), No. 4, pp. 383-390, pls. 2, figs. 3).—The sexual propagation of water hyacinth under natural conditions in Burma is recorded, and seedlings are described. Although much less extensive than asexual propagation, it must be considered in control measures. Suitable conditions apparently are a period of drought alternating with a period or periods of plentiful moisture.

Experiments from 1916 to 1923 on the harmful effects of weeds and their control on farm land [trans. title], E. KORSMO (*Meld. Norges Landbr. Høiskole*, 12 (1932), No. 5-9, pp. 305-716, figs. 38; *Eng. abs.*, pp. 682-698; *Ger. abs.*, pp. 698-715).—A report is made on numerous weed control experiments, made in cooperation with farmers and agricultural schools in Norway from 1916 to 1923, inclusive, and dealing with the control of weeds in spring cereals, peas, potatoes, and root crops by cultivation, fallow, and chemicals, the effects of weed growth and control measures on the yield and quality characters of crops, the water use of crops and weeds, the soil temperature and soil moisture in weedy and clean cultivated land, and the chemical composition of some species of weeds.

The eradication of weeds of arable land by sodium chlorate, A. W. LING and A. HAGGARD (*Jour. Min. Agr. [Gt. Brit.]*, 40 (1933), No. 3, pp. 224-228).—Sodium chlorate, applied in the fall at the rate of 2 cwt. per acre to very weedy heavy loam and used with the usual cultural operations for the control of weeds, eliminated couchgrass, creeping bentgrass, crowfoot, and shallow-rooted annual weeds. Creeping thistle was reduced by the treatment, but field and black bindweed, docks, dock seeds, and other fleshy, deep-rooted plants were not affected. The original leaves of dandelions were destroyed, but the roots retained their vitality and produced fresh shoots later in the season.

The use of chlorates as weed eradicators, D. CLOUSTON and A. HILL (*Scot. Jour. Agr.*, 16 (1933), No. 2, pp. 196-208).—Sodium and potassium chlorates as weed killers were demonstrated to be effective herbicides for a number of annual and perennial weeds and were best applied in solutions. A 5 percent solution for sodium chlorate and a 2.5 percent solution for potassium chlorate were convenient strengths. For perennials, autumn applications gave decidedly the better results. The efficacy of the chlorates for perennials was much enhanced if the soil was plowed before application. The residual effects and fire hazards of chlorates are pointed out.

The use of chlorates in weed control, D. CLOUSTON and A. HILL (*Highland and Agr. Soc. Scot. Trans.*, 5. ser., 45 (1933), pp. 128-135).—A briefer account of the above report.

Fire hazards in the use of oxidizing agents as herbicides, W. H. COOK (*Canad. Jour. Res.*, 8 (1933), No. 6, pp. 509-544, pl. 1, figs. 4).—The combustibility of organic matter-sodium chlorate mixtures in various proportions was tested at different relative humidities at the University of Alberta.

Mixtures containing more than 10 percent of sodium chlorate were found to be combustible enough to be hazardous at all relative humidities below 75 percent, but nonhazardous at higher humidities. The minimum moisture content required for protecting such mixtures as determined may be used to calculate

the approximate amount of any water-absorbing chemical to be added to sodium chlorate to render it safe. Admixture of calcium chloride or magnesium chloride with sodium chlorate renders the mixture safe when these protecting salts form one half and one third, respectively, of the resulting herbicide. Sodium chlorate-magnesium chloride mixture would be the most effective safe herbicide tested, but would be about only half as toxic as pure sodium chlorate. Several other salts tested as protecting agents were either ineffective or resulted in the decomposition of the chlorate.

Barium chlorate- and calcium chlorate-organic matter mixtures were found less inflammable than mixtures containing sodium chlorate, but combustible enough to be a fire hazard in dry districts. Addition of one part of anhydrous calcium chloride or magnesium chloride to two parts of barium chlorate resulted in a safe mixture. Sodium dichromate-organic matter mixtures were much less combustible than those containing chlorate, but also are somewhat dangerous at ordinary humidities when containing a high proportion of sodium dichromate. Addition of 10 percent of anhydrous calcium or magnesium chloride to the sodium dichromate makes the resultant mixture safe under ordinary atmospheric humidities, regardless of the proportion of organic matter present. Mixtures of sodium chlorate and sodium dichromate with organic material were found to be extremely combustible.

HORTICULTURE

[**Horticulture at the Idaho Station**] (*Idaho Sta. Bul.* 197 (1933), pp. 44, 45).—The results are briefly discussed of studies in apple breeding; the cracking of sweet cherries; the occurrence and nature of double cherry fruits; orchard fertilization; apple maturity and storage; and grape pruning.

[**Horticulture at the Moses Fell Annex Farm**] (*Indiana Sta. Circ.* 197 (1933), pp. 9, 10, 11).—Brief notes are presented on the results of variety and cultural tests with fruits, on the use of ice for cooling apples, on the removal of spray residues from apples, the mulching of apple orchards with straw, and on the management of the farm garden.

[**Horticultural investigations at the Puerto Rico Insular Station**] (*Puerto Rico Dept. Agr. and Com. Sta. Ann. Rpt.* 1932, *Spanish ed.*, pp. 23-29, 43, 44, 45).—Brief comments are made on the results of fertilizer studies with coffee, and propagation, varietal, and other studies with avocados, mangoes, grapes, oranges, coconuts, and various vegetables.

[**Horticulture at the Wisconsin Station**] (*Wisconsin Sta. Bul.* 425 (1933), pp. 61, 79-82, 83, 84, *fig.* 1).—General comments are presented on the results of studies on the effect of fertilizers on the quality of canned peas, by F. L. Musbach; on the new Wisconsin Early Sweet canning pea and a 100 percent wilt-resistant strain of the Perfection pea, by E. J. Delwiche; on varieties of vegetables, by J. G. Moore and O. B. Combs; on the pruning of sour cherries to admit light to the inner branches, by R. H. Roberts and L. Langord; and upon stock and scion relationships in the apple, by Roberts.

Effects of bulb shape and weight on the number of seed stalks of the Sweet Spanish onion, A. M. BINKLEY (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 432, 433).—No significant positive correlations were established at the Colorado Experiment Station between the number of seed stalks formed and the length, width, or weight of mother onion bulbs of the Riverside Sweet Spanish variety. Wide flat bulbs did not produce more stalks than did elongated bulbs. Significant correlations were observed between length and weight and even more so between width and weight of bulbs.

A simple device for use in leaf area studies, R. V. LOTT and H. W. LE MERT (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 83, 84).—A brief description is given of a device developed at the Mississippi Experiment Station for the rapid blueprinting of leaves. Later, at the investigator's convenience, the areas may be determined by the use of the planimeter.

Ultrapaque microscope equipment as an aid in stomatal studies, I. D. JONES (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 78, 79).—A description is offered of a method found successful at the North Carolina Experiment Station for examining the stomata of peach and other leaves.

An improved device to facilitate pollen distribution by bees, G. E. KING and A. B. BURRELL (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 156-159, fig. 1).—A further discussion (*E.S.R.*, 67, p. 389) of a device designed to aid in effective cross-pollination.

Pollen tube growth in diploid and polyploid fruits, A. AFIFY (*Jour. Pomol. and Hort. Sci.*, 11 (1933), No. 2, pp. 113-119, figs. 4).—Working with sweet cherries, *domestica* plums, and apples, diploid, hexaploid, and secondary polyploid, respectively, the author observed different types of pollen development in the styles, apparently correlated with the genetic and cytologic constitution of the several fruits. Three types of pollen growth were noted in the cherry, (1) no germination, (2) the production of a very short tube with an upward bend at its terminus, and (3) normal development. In the plum five types were observed, (1) no germination, (2) short growth with upward bend, (3) growth one fourth the length of the style, (4) growth one half the length of the style, and (5) normal growth. Four types were observed in the apple, (1) no germination, (2) short tube turned upward, (3) growth approximately one third the length of the style, and (4) normal development.

Progress report on fruit breeding, G. T. SPINKS (*Jour. Bath and West and South. Counties Soc.*, 6. ser., 7 (1932-33), pp. 163-168).—Brief descriptions are presented of named seedlings of apple, pear, plum, black currant, and blackberry originated at the Long Ashton Research Station, England.

Present status of mutation studies in deciduous fruit varieties, J. T. BREGGER (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 144-150).—Classifying bud mutations in deciduous fruits as follows: (1) Those with less desirable fruits, (2) those with more desirable fruits, and (3) those affecting other parts than the fruit, the author lists a large number of increased color mutations found among apple varieties. Of a total of some 228 known red strains in 35 varieties 55 were in the Delicious. In addition there are tabulated certain noncolor mutations in various deciduous fruits, and the nature and cause of mutations are briefly discussed.

Orchard management, with notes on varieties, A. B. FITE (*New Mexico Sta. Bul.* 209 (1933), pp. 52, figs. 25).—The establishment of orchards, methods of pruning, irrigation, fertilization, pollination, control of pests, and the characteristics of 53 apple varieties and a number of other fruits are discussed. Three arsenate of lead sprays followed by three sprays of pyrethrum and a proprietary white oil gave better control of codling moth in 1931 than did six sprays of arsenate of lead. Charts showing time of bloom and length of the blooming period are presented for a large number of varieties of apples, pears, plums, peaches, and cherries.

The potassium status of soils and fruit plants in some cases of potassium deficiency, T. WALLACE and E. L. PROEBSTING (*Jour. Pomol. and Hort. Sci.*, 11 (1933), No. 2, pp. 120-148).—Analyses made at the Long Ashton Research Station, England, of soils and samples of the growth and fruit of plants growing thereon showed that the potassium values of the soils were reflected in

those of the plant materials. Heavy applications of both farmyard manure and of potassium fertilizers raised the percentages of potassium in the surface soils appreciably. Plants on unmanured areas were low in potassium and suffered from its lack. The largest potassium differences were observed in the leaves and the least in the fruits. Where potassium had been applied to the soil in quantity it was usually present in the surface horizon in exchangeable form.

Orchard soil moisture under different fertility experiments, W. S. CLARKE, JR. (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 176-180, figs. 2).—Studies at the Pennsylvania Experiment Station in orchards located on limestone soil underlain with heavy clay and with underlying limestone rock at variable depths indicated that the treatment of the soil influenced materially the water content of the surface layer, especially during critical periods of drought. Differences in the contour of the orchard were a factor, as shown in a higher moisture content in the upper 6 in. on the lower part of cultivated slopes. In all cases plats of higher fertility contained more water in the spring, with the result that they grew better cover crops. Plats from which the cover crop was cut held their water level practically constant, but where the cover crop was growing it rapidly depleted the soil moisture. Alfalfa, because of its second growth, was more exacting in midsummer than was bluegrass.

The effect of pruning of excised shoots on the transpiration rate of some deciduous fruit species, V. W. KELLEY (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 71-73).—The removal at the University of Illinois of half the leaf area from shoots of Tolman Sweet apple, Kieffer pear, Gage peach, Early Richmond cherry, and Latham red raspberry showed in all but one case that the removal of leaves caused an increased transpiration in those remaining. This was true whether pruning consisted simply of removing leaves or in cutting off laterals, as was done with the peach. The rate increases ranged from 22 to 93 percent. The results in the one aberrant test are believed due to the high relative humidity (87 percent). Since the rate of transpiration per unit area was increased an average of about 50 percent, the removal of half the foliage resulted in the conservation of water and leads to the suggestion that summer pruning might have value in periods of severe drought and low humidity or in the case of trees over-stimulated by nitrogen and suffering from a lack of water.

Apple breeding: A study on seedling fruits produced by Longfield, H. L. LANTZ (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 139-143).—Observations at the Iowa Experiment Station on the progeny of four apple crosses, namely, Longfield \times Gano, McIntosh \times Longfield, Longfield \times Mt. Beet, and Ben Davis \times Longfield, comprising 125, 61, 27, and 13 fruiting trees, respectively, showed that, although the seedlings varied greatly in size, color, flesh, quality, and season, they tended to follow the characteristics of their parents. For example, a Longfield \times Gano progeny contained no seedlings worth naming, while McIntosh \times Longfield yielded two seedlings, Maude and Sharon, which were hardy, productive, and highly desirable in quality. Three fourths of the seedlings of Longfield \times Mt. Beet produced fruits below medium or small in size. In the crosses red fruit color proved dominant over yellow. Season of maturity was evidently governed by a factorial complex, but in general the seedlings followed the parents.

The value of the pollen of some of the recently introduced apple varieties, L. H. MACDANIELS and A. B. BURRELL (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 151-155).—Employing the branch unit method of pollination, studies conducted by Cornell University in western New York showed Twenty

Ounce, Opalescent, Oldenburg, and Cortland to be consistently good pollinizers for McIntosh, while Bismarck, Early McIntosh, Milton, Lobo, and Kendall gave more erratic results. In the Champlain Valley the McIntosh seedlings Macoun, Lobo, Milton, and Early McIntosh were not equal to Delicious as pollinizers for McIntosh. Medina on the other hand closely resembled its Delicious parent by having very effective pollen. Orenco, Hubbardston, and Macoun pollens proved effective on Northern Spy, and Opalescent, Ben Davis, Early McIntosh, Milton, Macoun, and Twenty Ounce all gave good sets on Rhode Island Greening. Kendall, Lobo, and McIntosh proved desirable as Cortland pollinizers, with Early McIntosh of dubious value. A tendency for light-blooming branches to set a larger percentage with any given pollen than did heavy-blooming branches caused some trouble in interpreting results.

Possibilities of affecting biennial bearing in York Imperial apples in the Cumberland-Shenandoah Valley, E. C. AUCHTER and A. L. SCHRADER (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 62-70).—Following severe spring frosts in western Maryland in 1921 and 1922 which killed a large percentage of the blooms of York Imperial trees previously handled in various ways with respect to nitrogen applications and pruning, all produced heavy crops in 1923, followed by an off year in 1924. Using the same trees, nitrogen was applied at various seasons. Again frosts interfered somewhat with results, but none of the several treatments had any material effect on the biennial bearing habit, even though growth was modified to a degree approximating that of annual bearing trees. The authors believe that soil moisture during the usual period of fruit bud initiation exerts an important role. A shortage tended toward restricted vegetative growth and heavy blossom bud formation. It is conceded that irrigation, by maintaining satisfactory soil moisture, should promote growth conditions which would reduce blossom bud formation in the off year and at the same time help increase blossom bud formation in the on year.

Relation of foliage system and fruit thinning to biennial bearing in apples, W. W. ALDRICH and L. A. FLETCHER (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 56-61).—As reported by the U.S. Department of Agriculture, the amount of fruit bud formation on unthinned York Imperial apple trees bearing a heavy crop was to a certain degree dependent on the leaf area per fruit. In the case of vigorous trees thinned heavily on or before June 18 increased leaf area per fruit increased fruit bud formation, while thinning on July 1 had no such effect. In the case of less vigorous trees the responses to thinning were less marked. Thinning treatments on June 24 and on July 8 had no apparent effects.

The removal on May 1, about 10 days before full bloom, of 90 percent of the flower clusters from two heavily blossoming vigorous trees did not appear to increase the set on the remaining clusters but did result in greatly increased fruit bud formation. Analyses of the entire current season's growth of spurs showed that only the 90 percent defloration treatment resulted in more starch and total polysaccharides, expressed either on the fresh or dry weight basis, than were present in the nonthinned trees. Reducing and total sugars were approximately the same for all trees analyzed. Fruit from thinned trees held for 21 days at 60° F. after harvest contained about 20 percent more total sugars than that from nonthinned trees.

Effect of thinning on size and color of apples, L. A. FLETCHER (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 51-55).—York Imperial and Jonathan apples thinned in 1931 to stand 4 to 6 in., 8 to 10, and 12 to 14 in. apart were improved in color and size in all cases, but at the greatest distance the yield was reduced. Comparable results were secured the following year with Jona-

than trees irrigated in 1930 and unproductive in 1931. Those trees thinned in early June to 100 leaves per apple produced 70 percent of their fruit with over 75 percent of color as compared with only 28 percent for the nonthinned trees. Even 50 leaves per apple gave good size and color. In addition to an increase in the quantity of color the quality was also improved. In York Imperial trees thinned to 100 leaves per apple produced the best colored and largest fruits, and in these trees applications of nitrate of soda did not reduce color as compared with the control trees. As concerned time of thinning, trees thinned to 50 leaves per apple on June 5 did not show improved color over the unthinned trees, whereas those thinned to the same extent on June 20 and on July 5 did respond. In both lots there was a size response to thinning.

The effect of sulfur fungicides applied during bloom on the set of apple fruits, L. H. MACDANIELS and A. B. BURRELL (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), p. 61).—Observations by the New York Cornell Experiment Station in various parts of the State indicated that sulfur dust and lime-sulfur spray 1 to 40 applied to apple blossoms were about equally potent in reducing the set of fruit, and that applications 24 hours before pollination were most injurious. Applications 24 hours or more after pollination reduced the set noticeably but not seriously, suggesting that under favorable pollination conditions spray or dust may be applied without serious losses. Stigmas cut off close to the ovary at various intervals up to 24 hours following pollination prevented setting. With daily temperature maxima of about 65° F. cutting of stigmas after 60 hours prevented setting, while at 80° cutting of stigmas after 48 hours had little effect.

The management of filler apple trees, F. N. FAGAN (*Pennsylvania Sta. Bul.* 290 (1933), pp. 11, figs. 7).—Discussing the principles and practices of ringing fruit trees to induce earlier fruiting, the author presents the results of ringing and heading experiments in a mixed variety orchard planted in 1917 so closely that the trees were crowding badly in their tenth year. In 1924 all of the filler trees were ringed with the following results, namely, increases in 1925 of 3, 3, 1.2, and 1.04 bu. per tree for the ringed Stayman Winesap, McIntosh, Rome Beauty, and Baldwin trees, respectively. A few nonvigorous Baldwin and Rome Beauty trees were killed by the ringing process, suggesting the inadvisability of ringing filler trees that are making weak growth. Despite the fact that severe heading in 1926, 1927, and 1929 of the ringed filler trees reduced their potential bearing surface very decidedly, this group yielded reasonably well and at the same time exerted no harmful effects on the permanent trees.

As to the technic of ringing, the simple drawing of a sharp knife through the bark was as effective as the removal of a ring of bark and decreased the hazard to the tree.

Growth of five- and six-year-old transplanted apple trees, R. L. McMUNN (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 74-77, fig. 1).—Measurements at the University of Illinois of Jonathan and Grimes Golden apple trees transplanted in 1919 some 5 and 6 years after reception from the nursery and those of comparable trees which were not moved showed little difference in size after a few years. In 1932 the nontransplanted and the transplanted Grimes Golden trees averaged 113.5 and 113.1 mm in radius, respectively. The nontransplanted Jonathans averaged 143.1 mm, only 5 mm greater than the transplanted trees of the same variety. The results suggest the possibility of making replacements in the orchard with rather sizable trees.

The relation of tree vigor to the rate of healing of pruning wounds in the apple, W. G. BRIERLEY (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 90-92).—

Observations at the University of Minnesota on the healing of wounds made in April 1928 in 12-year-old Wealthy and Oldenburg apple trees varying widely in vigor showed little or no correlation between vigor as measured in shoot growth and healing the first season. In 1929 the correlation between growth and healing was slightly significant in certain cases, while in 1930 the significance was beyond question. When the comparisons were made between wound healing and trunk increment, much the same story was manifest except that a significant relationship was more pronounced the second season. The drying back of the wound edges during the first summer is offered as an explanation of the lack of correlation that season.

Amount of mulch material required by apple trees, M. A. BLAKE (*New Jersey Stas. Circ.* 286 (1933), pp. 4).—Discussing the principles and practices of mulching fruit trees, certain data are presented on the amount of mulch required per acre for apple trees and on the costs of the material.

Winter injury to the crotch and trunk of the apple tree, F. HORSEFALL, JR. (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 85-89, figs. 2).—Analyses at the University of Missouri of samples of crotch tissues taken from ringed, root pruned, and control Grimes Golden and Stayman Winesap trees showed no significant differences in contents of sugar, starch, or hemicellulose. Observations in a large orchard of 14-year-old apple trees which showed a number of winter injured crotches suggested that there is a close correlation between winter injury and the distance from the crotch to the foliage. The lower the crotch in the tree the greater the chance of winter injury, due apparently to remoteness from foliage and elaborated foods. Wide angled crotches appeared more resistant to winter injury than sharp angled ones.

Gas storage of fruit.—III, Lane's Prince Albert apples, F. KIDD and C. WEST (*Jour. Pomol. and Hort. Sci.*, 11 (1933), No. 2, pp. 149-170, figs. 3).—Following an earlier contribution (*E.S.R.*, 62, p. 841), in which it was shown that increasing the carbon dioxide and lowering the oxygen in the storage chamber increased the keeping quality of Bramley Seedling apples, information is presented on the results of studies with the Lane Prince Albert apples harvested from trees of known fertilizer treatment and culture. At 39° F. an atmosphere containing 2.5 percent of oxygen and 5 percent of carbon dioxide kept the fruit in good commercial condition twice as long as in air at the same temperature. Analyses of the fruits indicated that at 39° increasing the concentration of carbon dioxide retards the loss of carbohydrates and of alcohol-insoluble material and accelerates the loss of acid and the hydrolysis of cane sugar. A reduction in the concentration of oxygen appeared to have little effect on the loss of carbohydrates or acid or on cane sugar hydrolysis but retarded the loss of alcohol-insoluble matter.

The inheritance of certain characters in the peach, J. S. BAILEY and A. P. FRENCH (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 127-130).—One out of every four seedlings obtained from self-pollinating the Champion peach were found by the Massachusetts Experiment Station to be pure albinos and therefore incapable of growth. Apparently the albino lethal character was a simple Mendelian recessive. Reniform leaf glands proved dominant to globose glands, and melting flesh was dominant over tough or nonmelting. In selfed seedlings of Elberta the freestone character was dominant over the clingstone. An absence of freestone nonmelting individuals in self-pollinations of Belle, together with the nonconformity of the data to a dihybrid ratio for independent assortment, leads to the assumption of linkage between stone adhesion and toughness of the flesh. However, in Champion there was evidence that the free-cling and the melting-nonmelting characters were inherited independently.

It is considered likely that either one or the other character may be controlled by a different set of genes in Champion than in Belle.

Elberta and its selfed and chance seedlings lack hardiness, M. A. BLAKE (*New Jersey Stas. Circ.* 287 (1933), pp. 4).—Observations at Westville and New Brunswick on the survival of fruit buds of various peaches showed Elberta and related varieties to be uniformly tender in the buds. At New Brunswick only 5 percent of Elberta fruit buds survived the winter of 1932–33 as compared with 90 percent for Greensboro. Golden Jubilee, an F_2 seedling of Elberta \times Greensboro, had 38 percent of live buds. J. H. Hale, supposedly a seedling of Elberta, also had 5 percent of living buds. The older varieties, Early Crawford, Oldmixon, Gold Drop, and Heath had 41, 61, 60, and 69 percent of living buds, indicating an apparent downward tendency in hardiness where Elberta, J. H. Hale, and their type have been used as parents for the newer varieties.

The J. H. Hale peach as a parent in peach crosses, M. A. BLAKE (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 131–136).—Seeking a peach with the fruit characters of J. H. Hale but with self-fertile flowers and a more adaptable and hardy tree, J. H. Hale was crossed at the New Jersey Experiment Stations with various commercial varieties and other forms of peach. In most cases the resulting F_1 seedlings closely resembled the pollen parent, suggesting that J. H. Hale is a recessive type, that is, largely a combination of recessive characters, possibly a recessive variation of Elberta. Among the types of inheritance observed were (1) red flesh color near the pit was apparently dominant over an absence of red, (2) blood red flesh was dominant over the absence of red, (3) heavy pubescence was apparently dominant over short or light pubescence, and (4) oval-conic, oval-oblong, and round pointed fruit shapes were dominant over purely round fruits.

Studies of pollen germination in certain species and interspecific hybrids of *Prunus*, C. L. BECKER (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 122–126).—Information is presented on the results of studies at the Minnesota Experiment Station on the viability of fresh and stored plum pollen, the effect of temperature on the percentage of germination and on the rate of pollen tube growth, and the relation of the age of pollen to germination and to development. Most of the Minnesota hybrid plums produced abundant pollen but of very low quality. Elliot, LaCrescent, Monitor, Red Wing, and Underwood pollens germinated 1 percent or less as compared with 8 to 14.3 percent for native varieties such as Wolf. Temperature greatly influenced the rate and length of pollen tube growth. Five- and 6-day-old pollen produced shorter tubes than did fresh pollen, and 12- to 13-day-old grains germinated very poorly. Fresh pollen produced more vigorous tubes with less tendency to burst.

Self and cross sterility in plum hybrids, W. H. ALDERMAN and E. ANGELO (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 118–121).—Studies conducted by the Minnesota Experiment Station with various hybrid plums, some of rather complex species parentage, failed to reveal any one plum of universal adaptability as a pollinizer. Surprise most nearly qualified, with a set ranging from 2.4 percent on Elliot to 16.7 percent on Red Wing. Rollingsstone, Desoto, and Wolf were also reasonably effective. It is stated that a set of from 4 to 6 percent will yield a very satisfactory plum crop. The only hybrids to find a place in the most effective and fair pollinizer classes were those carrying some portion of *Prunus simoni* inheritance.

Self sterility in the Burbank plum [trans. title], P. GALLI (*Bol. R. Ist. Super. Agr. Pisa*, 7 (1931), pp. 185–202, figs. 7).—At the Royal Agricultural Institute, Pisa, Italy, Burbank plum trees completely covered with cloth netting

set no fruit, while limbs exposed to cross-pollination with Santa Rosa set freely, indicating that Burbank is self-unfruitful but potentially interfruitful with compatible varieties.

Rootstock effects with cherries: Seed and phyton propagation, M. B. CUMMINGS, E. W. JENKINS, and R. G. DUNNING (*Vermont Sta. Bul.* 352 (1933), pp. 36, pls. 4, figs. 3).—Of six *Prunus* rootstocks, namely, *mazzard*, *mahaleb*, *serrulata*, *pennsylvanica*, *virginiana*, and *serotina*, used for propagating sweet and sour cherries, the last two made such poor unions with the scion that their use was soon abandoned. Early Richmond grew and fruited better on *mazzard* than on *mahaleb* roots, while Windsor did best on *serrulata* roots. *Mazzard* scions grew better on *mahaleb* than on their own or on *pennsylvanica* roots.

Mazzard on own roots fruited the second year but did not yield a good crop until the fifth year. *Mahaleb* on *mazzard* produced a good crop in four years from the graft. Early Richmond began fruiting in four years and produced more fruit on *mazzard* than on *mahaleb*.

Determinations of the acid and sugar contents of fruits produced by scions on different rootstocks showed no striking differences. However, Early Richmond and also *mazzard* appeared to be somewhat more acid when grown on *mazzard* than on *mahaleb* roots. No consistent differences were observed with respect to sugar content of the fruits. In general a larger percentage of pulp per fruit was produced on trees growing on their own roots than when on foreign rootstocks.

A 17 percent salt solution proved effective as a flotation medium for segregating viable from nonviable seeds. No cleaning, drying, or freezing process appeared beneficial in increasing seed germination, but a rest period of two months or more after harvest was needed to ripen the embryos. Various methods of asexual propagation by cuttings yielded negative results, but layering was successful, especially when some constriction was applied to retard the backward movement of synthesized nutrients. Root cuttings gave reasonable success, especially when taken in the fall and stored during the winter in sand and peat at about 40° F. By planting deeply roots were obtained from the scion portion of trees.

Parthenocarpy and seed abortion in *Vitis vinifera*, H. M. PEARSON (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 169–175, figs. 4).—In this contribution from the University of California, the author describes the conditions underlying parthenocarpy in the Red, Black, and White Corinth grapes and discusses seed abortion in the Sultanina, Sultanina Rosea, Sultanina Gigas, Sultana, and Monukka varieties.

In practically every case in Sultana, Sultanina, and Monukka abnormal development of the integuments could be detected at the time of anthesis. Ringing of the shoots not only increased the size of Sultanina berries but also that of the rudimentary seeds. Crosses involving the Sultanina type of seedlessness yielded seedless progeny so frequently that the author surmises that seedlessness in this case is based on comparatively few genetic factors, making it relatively easy to develop improved seedless varieties.

Results obtained from crosses between Danugue (Gros Guillaume) and Ontario and Hubbard grape varieties, R. WELLINGTON (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 137, 138).—That genetically pure *vinifera* grapes are an important factor in the improvement of the American grapes was indicated in studies at the New York State Experiment Station. Actually 41 and 43 percent, respectively, of the surviving plants of Hubbard×Gros Guillaume and Ontario×Gros Guillaume were selected for propagation on account of their desirable qualities. In the nursery over 80 percent of the original seedlings

of both crosses perished, apparently from winter injury. The vine and fruit characters of the seedlings indicated hybrid origin. The meaty flesh of the vinifera grape was observed in over half the seedlings of each cross and the vinous flavor in over three fourths.

The Cavendish group of banana varieties, with special reference to Lacatan, E. E. CHEESMAN, C. W. WARDLAW, and G. L. SPENCER (*Trop. Agr. [Trinidad]*, 10 (1933), No. 8, pp. 218-221).—Observations at the Imperial College of Tropical Agriculture, Trinidad, indicated that the Lacatan, Bumulan, Giant Fig, and Masak Hijau bananas are identical and should properly be designated Lacatan. This variety is said to be closely related to the dwarf banana, usually called *Musa cavendishi*, and to certain varieties of intermediate stature, including Congo. The entire assemblage forms one genetic group which might well be termed the Cavendish group.

Coffee in the Kona district, H. A. POWERS, J. C. RIPPERTON, and Y. B. GOTO (*Hawaii Sta. Bul.* 66 (1932), pp. 17-19, 20, fig. 1).—Culture, yields and fertilizer, and the relation of coffee to soil type are briefly discussed.

Starch in the young orange tree, S. H. CAMERON (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 110-114).—Analyses at the University of California of the various tissues of 3½-year-old Valencia orange trees dug at successive intervals throughout the year showed in general no marked fluctuations in starch except in the root bark. Following a minimum in July in the branches and in August in the trunk and roots, starch gradually increased to a maximum in early spring. An inverse relationship between starch content and moisture was evident.

Microchemical determinations were highly useful in localizing the starch changes, which were found confined mainly to the tissues adjacent to the cambium. Very slight changes were noted in the outer cortex, pith, and inner xylem of the older parts of the trees. Starch accumulated first in regions adjacent to the leaves and later in the branches, trunks, and roots. Fluctuations in starch content in the orange were very gradual as compared with those reported for deciduous trees.

Some effects of thinning fruits of Washington Navel and Valencia orange trees in California, E. R. PARKER (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 104-109, figs. 8).—Definite responses were observed at the Citrus Experiment Station, Riverside, Calif., from thinning the fruits of mature Washington Navel and Valencia orange trees carrying a heavy load of fruit. In the Washington Navel trees, in every case but one the thinned trees produced larger oranges the same crop season than did the control trees, and the severer the thinning the larger the remaining oranges. Records on the second crop following thinning showed smaller oranges on the thinned trees, indicating a reaction in the opposite direction. However, the total crops were larger on the thinned trees, compensating for the reduction the first season. Comparable observations were made on the Valencia oranges. In both varieties the total crop was reduced the year of thinning in proportion to the severity of the treatment. Whether or not thinning oranges has a commercial application is believed to depend to a large measure upon the premium for fruits of the larger sizes.

Some observations on stomatal movements in *Hicoria pecan*, B. G. SITTON (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 80-82).—By the use of a vertical illuminator equipped with an adjustable condenser and an iris diaphragm for light adjustment it was found possible to observe 100 or more stomata in about 1 minute. Pecan stomata apparently did not open until direct sunlight or very bright diffused light struck the leaves, and no considerable portion of the stomata on any single tree was open at once. With adequate moisture and

nonexcessive transpiration the stomata of pecans remained open as long as exposed to sunlight. On the other hand stomata on trees growing in soil near the wilting point closed as early as 10 a.m. and remained closed the rest of the day. Considerable variation was noted in stomatal behavior in different parts of the same tree.

Dichogamy: An important factor affecting production in the Persian walnut, M. N. Wood (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 160-163).—As determined by the U.S. Department of Agriculture, all varieties of the Persian walnut are self and interfertile. Furthermore, interfertility exists between *Juglans regia* and other species tested, including *J. hindsii*, *J. californica*, and *J. sieboldiana*. Dichogamy on the other hand was found to interfere materially with pollination, some varieties being distinctly protandrous and others protogynous. Dichogamy varied with the age of the tree, being more complete in young trees, and was affected also by the weather, particularly temperature. The ideal planting arrangement would include protandrous and protogynous varieties blooming at the same time. For example, the protandrous Payne and the protogynous Lucretia paired satisfactorily. Grafting of suitable pollinizers into trees where dichogamy interfered with set was highly effective.

Artificial pollination as a means of increasing production in commercial Persian walnut orchards, M. N. Wood (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 164-168).—Walnut catkins placed in mosquito netting sacks and suspended in trees yielded sufficient pollen when jarred once a day to effect adequate pollination and induce sizable crops in orchards previously unproductive. The beneficial effects varied from year to year, but in all four orchards there was some increase in all cases, the increases ranging from 141 lb. to 3,084 lb. of nuts per acre.

Flower growing, A. LAURIE, V. H. RIES, L. C. CHADWICK, and G. H. POESCH (*Ohio Sta. Bul.* 525 (1933), pp. 49, figs. 8).—A general discussion of flowers and their culture, supplemented with certain experimental data. A combination of superphosphate and ammonium sulfate yielded the longest stemmed dahlias, but the heaviest root clumps were produced with a complete fertilizer plus manure mulch. Superphosphate 5 lb. per 100 ft. of row gave excellent results with gladiolus with respect to new corms and cormlets and the number of flowering stalks. When the pH of the soil was increased to 7.5 production of gladiolus was decreased. Of various treatments for gladiolus cormlets the shucking of the outer covering before planting gave the best results as measured in germination. However, a 10-minute immersion in commercial sulfuric acid followed by rinsing in clear water was satisfactory and more practical. Asters grown under cloth developed no yellows disease, and favorable results were secured with other species, including snapdragons, calendulas, chrysanthemums, and dahlias. The abbreviation of the photoperiod by the use of black cloth hastened the blooming of pompom chrysanthemums.

China asters, C. H. CONNORS (*New Jersey Stas. Circ.* 289 (1933), pp. 4).—The general cultural requirements are discussed, with information on insect and disease control contributed by C. C. Hamilton and R. P. White, respectively.

Ornamental trees and shrubs, A. E. SEAMANS (*U.S. Dept. Agr., Tech. Bul.* 353 (1933), pp. 47-49).—Brief comments are presented on the results of tests at the Huntley, Mont., Field Station of various shelter belt trees and ornamental shrubs with respect to hardiness, growth, and susceptibility to insect and fungus pests.

The care of evergreens, C. H. CONNORS (*New Jersey Stas. Circ.* 288 (1933), pp. 4).—In a general way the author discusses the culture, pruning, and pests of evergreens. Information on plant diseases and insects is supplied, respectively, by R. P. White and C. C. Hamilton.

FORESTRY

Growth and yield in oak forests of Pennsylvania, A. C. McINTYRE (*Pennsylvania Sta. Bul.* 283 (1933), pp. 28, figs. 8).—Based on measurements taken in sample plats laid out in oak forests in 42 counties, yield tables are presented for different aged forests on different quality sites and volume tables for several species of oaks and for red maple and hickory. The forests under study were composed largely of five oaks, white, chestnut, red, black, and scarlet, associated in varying proportions. Although the several oaks varied slightly in form, volume, and growth rates, the differences were small and within the limits of error. Under average conditions Pennsylvania oak stands were found to be growing at the rate of 0.6 cord per acre per year, with somewhat larger increases on moist, fertile sites. More than 40 tree species are listed among associates occurring with the oaks.

Some effects of varying amounts of nitrogen on the growth of tulip poplar seedlings, A. G. CHAPMAN (*Ohio Jour. Sci.*, 33 (1933), No. 3, pp. 164-181, figs. 7).—One-year-old tulip poplar seedlings growing in the greenhouse in 1-gal. glazed earthenware jars and supplied with ammonium nitrate at the estimated rates of 20, 40, 100, 200, and 400 lb. of actual nitrogen per acre made the greatest average weight growth in two seasons in the 100-lb. group, the average weights decreasing above or below this point. Only an insignificant amount of nitrate nitrogen accumulated in the seedlings, irrespective of the concentration of ammonium nitrate in the soil. Leaves of plants supplied with from 40 to 200 lb. of nitrogen were rich dark green. The 400-lb. lot showed a blotching of yellow on the older leaves which soon turned brown and dropped. High and low extremes of nitrogen seemed to hasten the beginning and end of dormacy. An increase of the shoot-root ratio was associated with an increase in the nitrogen supply.

Yellow poplar characteristics, growth, and management, E. F. MCCARTHY (*U.S. Dept. Agr., Tech. Bul.* 356 (1933), pp. 58, figs. 18).—Fine quality of wood, good form, rapid growth, comparative freedom from insects and disease, and a wide natural distribution are said to combine to make the yellow poplar a valuable timber tree. Regeneration is accomplished by means of seeds or sprouts, and the young trees once established grow rapidly and overcome competition. The best natural seeding was observed in abandoned fields where competition with hardwood sprouts was negligible and where the climate and soil moisture were favorable. Old yellow poplar trees failed to sprout, but young and vigorous root systems sprouted vigorously and yielded a remarkable second growth.

A general discussion is presented of the distribution of the species, supply and demand, growth and yield, soil and light requirements, managerial practices, possible returns per acre, etc.

Volume and yield tables and a list of the botanical names for associated species are appended.

The density of spruce and fir reproduction related to the direction of exposure, H. I. BALDWIN (*Ecology*, 14 (1933), No. 2, pp. 152-156, fig. 1).—Studies in an isolated dense stand of red spruce with a scattering of white spruce and balsam fir located at Dummer, N.H., showed sufficient reproduction on all sides of the stand irrespective of exposure to provide for full stocking. However, reproduction was most abundant on the north and east sides, corresponding evidently with a greater protection from sun and wind. Density within the stand was least on the west, possibly because the slanting rays of the sun and the prevailing winds caused greater dryness.

The root system of longleaf pine on the deep sands of western Florida, F. HEYWARD (*Ecology*, 14 (1933), No. 2, pp. 136-148, figs. 6).—Descriptions are presented of the root growth of longleaf pines excavated from three sites on the Choctawhatchee National Forest, Fla., (1) old field, (2) a mixed stand of longleaf pine and turkey oak, and (3) a poorly drained area adjacent to a swamp. The tap roots were much shorter on the poorly drained site, attaining a length of only 22 to 29 in. as compared with 3 to 6 ft. on well drained locations. The tap root of a mature longleaf pine on a deep sandy soil was over 14 ft. in length, and one lateral extended 75 ft. Approximately 90 percent of the lateral roots were located in the upper foot of soil.

A study of natural reproduction in Vermont forests.—II, The effect of thinning on white pine reproduction, G. P. BURNS (*Vermont Sta. Bul.* 354 (1933), pp. 24, pls. 8, figs. 7).—Detailed observations on thinning plats laid out in several Vermont forests led the author to conclude in this second contribution (*E.S.R.*, 65, p. 436) to the general subject that white pine forests cannot be reproduced satisfactorily in the area studied by natural reproduction or by any of the grades of thinning used in practice.

In a forest near Burlington composed largely of white pine from 40 to 60 years of age spading the soil and applying ground limestone increased the germination of white pine and red maples in the control area, but none of the pine survived. Spading or spading plus liming in the thinned plats where the crown cover had been reduced from 83 to 26 percent noticeably increased the number of seedlings, particularly of red maple and birch. However, not a single white pine seedling ultimately survived on the spaded and limed area, with 5 of the original 7 white pines surviving on the spaded area. Only red maple and birch survived, indicating an ultimate birch stand.

Where crown cover was reduced from 83 to 51 percent 59 white pine seedlings germinated on the spaded and limed section, but only 6 were alive in 1926. Ditching to cut off competing roots resulted in the highest white pine survival (15 of 120 germinations).

Comparable results were obtained in another series. The only area in which a white pine stand was secured was in a location upon which cattle ranged, apparently eating the competing hardwoods. It is believed that on similar sites the reproduction of white pine on a commercial basis can be best secured by direct planting.

An analysis of log production in the "Inland Empire" region, M. BRADNER, F. J. KLOBUCHER, J. W. GIRARD, and S. V. FULLAWAY, JR. (*U.S. Dept. Agr., Tech. Bul.* 355 (1933), pp. 87, figs. 50).—Output data collected in this area during the period 1919-1928 from logging crews of standard size are presented in graphical form with discussion.

Sawing output up to certain sizes of logs was influenced to the greatest degree by the diameter of the timber. In general there was noted a fairly rapid increase in output per saw crew per hour for each 2-in. diameter increase up to 30 to 40 in. diameter at breast height. The maximum output per crew per hour varied somewhat with species. The time spent in moving from tree to tree and in brushing out was a considerable factor in the lower output from small trees. In trees above the maximum size the decreased output was attributed to the length of saw, additional physical effort required, and increased breakage. The differences in output between summer and winter were greater in skidding and chuting operations than in sawing.

Distance from the landing, the slope, and the operating season were very important factors in determining skidding output, which decreased rapidly as the size of the timbers decreased, due partly to the greater amount of time

required to load the smaller logs. Moderate slopes were an important factor in increasing outputs where such methods as horse or tractor skidding or horse trailing were employed. The basic facts or principles of logging applicable to skidding operations also applied to trailing in chutes and hauling on drays, sleighs, and autotrucks.

In loading operations logs up to 12 per 1,000 bd. ft. were handled more rapidly than larger ones, but the actual output increased up to the largest sizes. In unloading there was a very rapid increase in output as the size of the timber increased.

With respect to swamping and slash disposal, size and height of timber, stand per acre, species composition, breakage, and season were all important factors.

Appended are recommendations for the conduct of logging output studies, labor and cost supply tables, and a glossary of logging terms employed.

Forest fires: An area class study, B. E. LEETE (*Ohio Sta. Bimo. Bul.* 163 (1933), pp. 107-109, fig. 1).—A study of records of 1,878 forest fires extinguished in 12 counties in southern Ohio in the period 1927-1931 showed an average burned-over area of 27 acres. Dividing the burnings into six classes, namely, 0 to 0.2 acre, 0.3 to 10, 10.1 to 30, 31 to 100, 101 to 500, and 500 plus acres, it was observed that 52.8 percent of all the fires were restricted to 10 acres or less and that only 6 percent of the total acreage burned was in the two smallest classes. Only four fires exceeded 500 acres in extent. Information on the cost of fire suppression is included.

Ohio Forest News, [July 1933] (*Ohio Forest News [Ohio Sta.]*, No. 22 (1933), pp. 8, figs. 2).—A presentation of general information on forests and forestry, including a discussion of red pine in Ohio.

DISEASES OF PLANTS

Plant pathology (*Idaho Sta. Bul.* 197 (1933), pp. 45-48).—Data are given on investigations of potato virus diseases, mosaic and curly top of beans, bacterial wilt of alfalfa, powdery mildew of clover, and snow scald of wheat and barley.

[Plant disease studies at the Puerto Rico Insular Station] (*Puerto Rico Dept. Agr. and Com. Sta. Ann. Rpt.* 1932, Spanish ed., pp. 30, 37, 43).—Results are briefly reported of studies for the control of cucumber mildew (*Peronoplasmodium cubensis*) and of various diseases of sugarcane.

[Plant disease studies in Wisconsin] (*Wisconsin Sta. Bul.* 425 (1933), pp. 82, 83, 96-112, figs. 5).—Results are briefly noted of studies on the menace to tobacco by cucumber mosaic and the transmission of this disease by aphids, by I. A. Hoggan (pp. 82, 83); inheritance of resistance to yellows in kohlrabi and brussels sprouts, by J. C. Walker, M. E. Anderson, and L. M. Blank (pp. 96, 97); new developments in breeding yellows resistant cabbage, by Walker et al. (pp. 97, 98); *Verticillium* wilt of eggplant, tomato, and potato, by Walker and W. V. Ludbrook (pp. 99, 100); a survey of bulb rots of the onion, by Walker and Blank (pp. 100, 101); bean mosaic, by W. H. Pierce and Walker (pp. 101, 102); pea root rot, by Walker and E. J. Delwiche (pp. 102, 103); effectiveness of adhesive tapes in controlling overgrowths of apple grafts, by A. J. Riker and E. M. Hildebrand (pp. 103, 104); crown-gall, hairy-root, and radiobacter organisms, by Riker, A. A. Hendrickson, I. L. Baldwin, and H. E. Sagen (pp. 104, 105); control of cherry leaf spot by Bordeaux mixture, by G. W. Keitt and E. C. Blodgett (pp. 105, 106); new types of sulfur spray materials v. liquid lime-sulfur, by Keitt and Blodgett (pp. 106, 107); bacterial wilt of corn, by S. S. Ivanoff, Riker, and J. G. Dickson (pp. 107, 108); value of formaldehyde dust in oat smut control, by Dickson, B. D. Leith, and W. H. Tharp

(pp. 108, 109); and control of stripe disease, loose smut, and scab of barley, by Dickson (pp. 109-112).

First supplementary list of parasitic fungi from Iowa, J. C. GILMAN (*Iowa State Col. Jour. Sci.*, 6 (1932), No. 4, pp. 357-365).—This list adds 35 fungi hitherto unrecorded in the State and 26 new host records.

Notes on some rust collections from Colorado, Wyoming, and South Dakota, H. W. THURSTON, JR., and F. D. KERN (*Mycologia*, 23 (1931), No. 1, pp. 77-82).—A list of 97 collections representing 12 genera and 53 species. Eleven host plants are recorded as new to North America.

Root formation and bacterial plant tumors [trans. title], B. NĚMEC (*Plant Physiol. Lab. Charles Univ., Prague, Studies*, 4 (1932), No. 2, pp. 6, fig. 1; *Eng. abs.*, p. 6).—Decapitated epicotyls of *Aesculus hippocastanum* smeared on the cut surface with a culture of *Pseudomonas rhizogenes* produced a large and irregular callus, and on this callus adventitious buds were formed which grew very slowly in comparison with noninfected plants. After some time the callus produced adventitious roots which never appeared on a normal callus. The author believes that *P. rhizogenes* secretes some substances retarding the growth of buds, but evoking the appearance of adventitious roots.

Nematode infestation symptoms on barley as a means of determining the efficiency of chemicals as lethal agents against *Tylenchus dipsaci* Kuhn, W. NEWTON, R. J. HASTINGS, and J. E. BOSHER (*Canad. Jour. Res.*, 9 (1933), No. 1, pp. 37-42, pl. 1).—Owing to the rapid development of nematode disease symptoms on barley, it is suggested as a detector crop for the presence of living nematodes, *T. dipsaci*, in soil.

A satisfactory source of inoculum consists of the white masses of coiled nematodes that can be seen when the basal plate is removed from badly diseased narcissus bulbs. These masses remain viable for six months or longer when removed from the bulbs.

Low temperatures and high light conditions favor the development of the nematode disease symptoms in barley seedlings after nematodes are transferred from narcissus bulb to autoclaved soil planted with barley. Such barley seedlings were broad-leaved and stocky. Under low light and high temperatures, conditions that favor the development of spindly seedlings, the nematode disease symptoms are inconspicuous or absent.

Few chemicals appear to be lethal to the bulb nematode. Of 100 tested, only phenol, silver nitrate, and potassium or sodium bisulfite were lethal at dilute concentrations.—(*Courtesy Biol. Abs.*)

The overwintering of bunt spores in western Canada, W. F. HANNA and W. POPP (*Sci. Agr.*, 13 (1933), No. 10, pp. 636, 637).—Bunt (*Tilletia tritici*) spores in infected heads of Mindum wheat, placed on the surface of the soil, overwintered successfully at Winnipeg, Morden, Brandon, Indian Head, Saskatoon, and Edmonton, in Canada. Except at Winnipeg, spores overwintering in heads buried 6 in. in the ground were less viable than those overwintering on the surface, or failed to germinate.

Studies on foot and root rot of wheat.—II, Cultural relationships on solid media of certain micro-organisms in association with *Ophiobolus graminis* Sacc., W. C. BROADFOOT (*Canad. Jour. Res.*, 8 (1933), No. 6, pp. 545-552, pl. 1).—In continuing the study previously noted (*E.S.R.*, 69, p. 529), the antagonistic and compatible growth relationships of 66 cultures of bacteria and fungi, mostly from the soil, toward *O. graminis* on potato dextrose agar and Molisch's salt peptone agar were compared with the effect of each on the virulence of this pathogen on wheat seedlings in open soil culture. Apparently the growth reaction of the various micro-organisms and *O. graminis* associated

on the two solid media used is not a reliable indication that the same micro-organism will or will not suppress the virulence of this pathogen on wheat in soil in open pot culture.—(*Courtesy Biol. Abs.*)

The type of infection of wheat seedlings by *Puccinia graminis tritici* in the greenhouse as a measure of the percentage infection in the field, K. W. NEATBY (*Sci. Agr.*, 13 (1933), No. 10, pp. 625-635).—Comparative studies of greenhouse seedling reactions and field reactions in Marquillo × Reward, Garnet × Marquillo, and Garnet × Double Cross furnished results indicating that the inheritance in these crosses of the field reaction to stem rust, as determined by percentage infection, is mainly if not entirely controlled by the factors governing the inheritance of the seedling reaction to form 21 in the greenhouse, as determined by pustule type. There is no evidence that Marquillo or Double Cross possesses any mature-plant resistance such as that identified in connection with H-44-24 and Pentad.

Regulations relating to the extermination of *Rhamnus catharticus* and *Berberis* in Estonia [trans. title], E. LEPIK (*Mitt. Phytopath. Versuchsstat. Univ. Tartu No. 14* (1933), pp. 8, pl. 1, figs. 9).—The author discusses the control of cereal rusts (*Puccinia graminis* and *P. coronifera*).

Relative varietal susceptibility of beans grown in Poland to halo-blight disease [trans. title], K. ZALESKI (*Rocz. Nauk Rolnicz. i Leśnych (Polish Agr. and Forest Ann.)*, 30 (1933), No. 1, pp. 39-116, pls. 4; *Eng. abs.*, pp. 113-115).—This paper presents a summary of 15 months' varietal testing for relative resistance to bacterial halo-blight (*Phytophthora medicaginis phaseolicola*), which in 1931 was observed for the first time in Poland by the author in the vicinity of Poznań (Posen), where it caused severe economic losses. A virulent strain of the pathogen was isolated and its pathogenicity proved. Large samples of 144 distinct bean varieties were tested. Botanically, 139 of them (103 dwarf and 36 pole) belonged to *Phaseolus vulgaris* and the remainder to *P. multiflorus*. Experiments were mainly conducted in greenhouse benches, but partially also in the field over the 2-year period 1931-32. Each variety was tested at three different times for resistance, using the individual artificial inoculation method. Results of infection were taken from each plant, and the summarized data from them were obtained through counting by the method of averages. Based on the average degrees of infection, there were created 6 groups of relative varietal resistance, viz, immune, very resistant, moderately resistant, moderately susceptible, very susceptible, and wholly susceptible. Some varieties of *P. multiflorus* are given as new hosts of *P. medicaginis phaseolicola*, although they generally represent a high degree of halo-blight resistance. Symptoms of the disease are given in detail, particularly according to the many observations made. On 89 varieties the color of flowers was noted, but no correlations were found between white flowering and factors for resistance or purple flowering and factors for susceptibility. However, no variety of immune or very resistant type possessed purple flowers, within the material observed. Generally speaking, the results are in full agreement with the American work and confirm the high virulence of the organism, and there are but few of the field (dwarf) bean varieties showing a high degree of resistance.

Environmental factors in relation to snap-bean diseases occurring in shipment, J. I. LAURITZEN, L. L. HARTER, and W. A. WHITNEY (*Phytopathology*, 23 (1933), No. 5, pp. 411-445, figs. 4).—*Colletotrichum lindemuthianum* will infect not only wounded but also wound-free beans when the pods are sprayed with a water suspension of spores. Infection took place in beans inoculated by means of a needle prick at 8°-33° C. and in beans inoculated by spraying at 7°-27°. Lesions have developed in visibly healthy pods sorted out from stock

showing the presence of anthracnose, when stored at 7.5°–29°. The optimum for infection is 22°–25°, the highest percentage usually occurring at 25°. The shortest time in which infection has been observed to occur at 22°, 25°, and 27° was 5 days; at 15.5° and 17.5°, 7 days; at 12°, 9 days; at 10°, 12 days; and at 7°, 14 days. Spores obtained from the living host seem to be more virulent than those from artificial cultures.

All attempts to obtain infection by spraying snap beans with a water suspension of *Bacterium phaseoli* were unsuccessful. Infections through needle pricks were obtained at 2°–31°. Development of blight lesions at 1.2°–35° was observed in beans free from visible signs of infection, which were sorted out from lots showing the presence of blight. The development was very slight at 35° and rather slow at 7° and below. There was little difference in the amount of blight that developed from 10° to 24.5°.

Infection of snap beans by *Sclerotinia sclerotiorum* was obtained at 0°–28°, although the time required for infection to occur at 15.5°–27.5° was not accurately determined. From 5 to 15 beans had been infected from one point of inoculation in 4 days at three temperatures. The earliest infection at 12° was observed in 4 days, at 8° in 6 days, at 5.5°–6° in 9 days, at 1.8°–2° in 11 days, and at 0° in 15 days. The optimum for infection is approximately 19°–24°.

The temperature range at which infection of snap beans has been obtained by *Pythium butleri* extends from 12° to 35.6°. Infection at 12° and 15.5° was limited to the inoculated beans after 16 days' storage. The optimum for infection is about 31°.

Rhizoctonia solani infected snap beans at 0.9°–35.5°. Twenty days were required for infection to start at 0.9° and 2°, and 16 days at 5.5° and 8°. The optimum for infection is 24°–32°.

Infection by *Sclerotium rolfsii* was obtained on snap beans at 8°–35.6°, the latter being near the maximum temperature. Infection at 8° and 12° was limited to the inoculated pod after 11 days of storage. No infection occurred below 8°.

Infection by *Rhizopus tritici* and *R. nigricans* is not dependent on artificial inoculation and will occur to some extent in snap beans exposed above 30°. Infection has been observed in both inoculated and uninoculated beans from 12° to 35.5°. Infection below 25° is usually very slight. No infection has ever been obtained below 12°.

Botrytis cinerea has infected snap beans at 0°–35.5°. Infection occurred at 12°, 15.5°, 17.5°, 23°, 28°, and 35.5° in 4 days. Judging by the amount present at the various temperatures, infection was still in the initial stages. Infection took place at 6° and 8° in 6 days, at 2° in 11 days, and at 0° in 15 days.

Deterioration of snap beans, aside from that produced by micro-organisms, is very rapid above 20°, especially at 35.5°, and decreases with the lowering of the temperature. In snap beans shipped from Florida to Washington, D.C., the quality remained good for from 4 to 15 days at 6°–7° and for from 6 to 15 days below 6°. Taking into consideration both the quality of snap beans and the diseases likely to occur in transit, shipment below 10° is desirable and the lower the temperature (above the freezing point of beans) the better.—(Courtesy Biol. Abs.)

Inheritance of Fusarium resistance in brussels sprouts and kohlrabi, L. M. BLANK and J. C. WALKER (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 11, pp. 1015–1022).—Employing similar methods to those reported in studies with cabbage (E.S.R., 63, p. 344) initial selections of resistant plants were made from commercial varieties growing on soil heavily infested with yellows (*F. con-*

glutinans). When such individuals were self-pollinated the progenies of some proved to be completely resistant and in the case of others segregated in a ratio approximating three resistant to one susceptible plant. Crosses of plants from completely resistant progenies with homozygous susceptible plants yielded all resistant progeny in the F_1 generation, indicating that resistance is based on a single dominant Mendelian factor. Selfing of these resistant F_1 plants yielded progeny three fourths of which were resistant and one fourth susceptible. Back-crossing of the F_1 hybrids upon susceptible plants yielded progeny one half resistant and one half susceptible.

The possibility of developing homozygous *Fusarium* resistant lines of brussels sprouts and kohlrabi is believed demonstrated.

Maize pinking, A. R. SAUNDERS (*Farming in So. Africa*, 8 (1933), No. 88, pp. 249, 250, figs. 3).—The author cites the two most important types of pinking in maize—pink rot, due to *Gibberella saubinetii*, and the condition here dealt with. This consists of the development of purple pigment in the pericarp of the grain, which is shown to be not an infectious disease but an inheritable tendency dependent for its development on sunlight and not injuring the grain for milling and sampling purposes. Both types of pinking are controlled through seed selection, although with pink rot crop rotation is also needed.

The tubercles found by *Ustilago maydis* [trans. title], B. NĚMEC (*Plant Physiol. Lab. Charles Univ., Prague, Studies*, 4 (1932), No. 2, pp. 22, figs. 10; *Eng. abs.*, pp. 21, 22).—The swellings caused by *U. maydis* on the stems of *Zea mays* are described. The gall consists of the epidermis, a parenchymatous ground tissue, and an irregular net of bundles, mostly phloem bundles. The parenchymatous ground tissue is essentially composed of diploid cells, but among them are many tetraploid and some giant polyploid cells with one large or two or more smaller nuclei. Mitotic division of the polyploid cells proceeds in a normal manner, but sometimes irregularities occur, tripolar spindles especially having been found. In many cells, different stages of nuclear fusions have been observed. Large polyploid cells may be formed through repeated mitosis without subsequent cell division and through nuclear fusion.

During the spore formation of *U. maydis* the galls stop their further development, the cells decay, and the gall dies. Between polyploidy and the etiology of the tumor no relation exists. Polyploidy is the result of abnormal conditions in the gall, not the cause of the gall. The galls caused by *U. maydis* resemble in some respects crown galls. The author believes that bacterial tumors can be regarded as true galls.

An experiment on the incidence and spread of angular leaf-spot disease of cotton in Uganda, C. G. HANSFORD, H. R. HOSKING, R. H. STOUGHTON, and F. YATES (*Ann. Appl. Biol.*, 20 (1933), No. 3, pp. 404-420, figs. 8).—At two centers in Uganda, sterilization of the exterior of the seed by sulfuric acid and mercuric chloride reduced the amount of the disease throughout the season. Treatment of the seed with a bactericidal dust (Granosan) had a beneficial effect on total germination. Primary infection was almost entirely limited to plats sown with seed inoculated with the organism (*Bacterium malvacearum*), but secondary infection of other plats occurred by spread from these plants and showed a directional tendency following the downward slope of the ground and along the lines of surface wash.—(*Courtesy Biol. Abs.*)

Persistent strands of the root-rot fungus in Texas, H. C. McNAMARA, R. E. WESTER, and K. C. GUNN (*Science*, 77 (1933), No. 2004, pp. 510, 511).—The authors found in 1931 and 1932 that the carry-over infection with *Phymatotrichum omnivorum* is not due entirely to sclerotia, and that most of the in-

fection overwinters in the surface foot of soil as strands rather than as the sclerotial stage. Viable strands were found three or more years after cotton had been grown in a soil. The morphology and histology of these strands are briefly delineated.

The downy mildew of the hop in 1932, E. S. SALMON and W. M. WARE (*Jour. Southeast. Agr. Col., Wye, Kent, No. 32 (1933), pp. 108-119, figs. 2*).—The season of 1932 is discussed in its relation to downy mildew attack. It was again found that no harm resulted from spraying hops when in bur. Additional evidence was obtained that complete prevention of downy mildew on the crop can be obtained without applying Bordeaux mixture to the cones. Cases occurred in the winter of 1931-32 where loss was suffered in hop gardens owing to downy mildew attacking and killing the rootstocks ("hills").

Further observations and experiments on the origin and control of onion mildew, P. A. MURPHY and R. MCKAY ([*Irish Free State*] *Dept. Agr. Jour., 31 (1932), No. 1, pp. 60-76, pls. 2*).—The origin of mildew in the onion crop at Glasnevin was studied during the years from 1925-26 to 1929-30. In four of these years the disease originated from autumn-sown onions which had contracted infection in the seedling stage from the spring onion crop of the previous season. In the remaining year infection was contracted from the soil in the spring.

Early sowing of the autumn crop in the vicinity of mildewed spring onions favored the infection of the seedlings, and even when sown at the normal time late in August infection took place unless the sources of infection had been killed before the seedlings appeared. Sowing at a distance of 500 yd. from mildewed onions prevented infection at Glasnevin, as did sowing under glass in spring, but the occurrence of one infected seedling per 1,000 in autumn-sown onions in May was found to result in a serious outbreak involving one fourth or more of the crop. Timely removal of such infection centers either suppressed the disease completely or materially postponed its development.

Resting spores were found to occur abundantly in the leaves and flowering shoots in certain years, but attempts to germinate them were almost entirely unsuccessful. They were found to survive in the soil in an ungerminated condition for at least 3 years. Attempts to originate the disease from soil artificially contaminated with resting spores were largely unsuccessful, but proof was obtained in a controlled experiment that naturally contaminated soil freely conveyed the mildew to seedling onions.

The fungus is conveyed through the air by means of summer spores during the growing season, but these spores are delicate and short-lived, and except in particularly favorable years the disease was found to remain restricted to the neighborhood of primary outbreaks, at least until late in the season. Although the flowers were invaded, no evidence of seed infection was found. Plants failed to set seed when the flowering shoot was attacked by mildew. Certain varieties were found to be comparatively resistant in the foliage, but a very large proportion of their bulbs were invaded, while the bulbs of others were more resistant than the foliage.

The mildew was killed in infected bulbs when heated in air at 104°, 109.5°, or 113° F. without appreciable injury to the bulbs, but the duration of the treatment varies, depending on the variety, size of bulbs, and number treated. Under the experimental conditions given, heating for 24 hours at 104° or 109.5° and for 8 hours at 113° was fully effective.

A new vascular *Fusarium* disease of peas, W. C. SNYDER (*Science, 77 (1933), No. 1996, p. 327*).—This is a report from the University of California of a new wilt disease with many of the characteristics of that due to *Fusarium*

orthoceras pisi but due to another *Fusarium* sp. The two diseases can be definitely distinguished only by culturing the fungus. Some varieties resistant to the older wilt were found susceptible to the new.

Leaf disease of potatoes, F. ESMARCH (*Die Blattrollkrankheit der Kartoffel*. Berlin: Julius Springer, 1932, pp. [3]+91, figs. 6).—This monograph includes discussions of the history, geographical distribution, and economic significance; course and symptoms; histology; physiology (carbohydrate and protein metabolism, respiration, and transpiration); transmission (by tubers, seeds, soil, insects, contact, and weeds, and artificially); influence of weather and climate, soil, location, manuring, and culture methods on the disease; internal factors (varieties, developmental stage of plant, ripeness, storage, and germination relations of seed potatoes); etiology (virus and physiological theories); and control. A comprehensive bibliography of the subject is included.

Virus diseases of the potato [trans. title], W. VON BREHMER and J. BÄRNER (*Arb. Biol. Reichsanst. Land u. Forstw.*, 18 (1930), No. 1, pp. 1-54, pl. 1, figs. 32).—The literature covering the various types of foreign bodies found in connection with virus diseases of plants is reviewed at some length. An organism found by the authors in potato plants affected by virus disease is described and given the name *Plasmodiophora solani*. This organism is found in apparent parasitic relation with the nucleus and attached to the starch grains.

Experiments on the transmission of degeneracy diseases of the potato [trans. title], G. VERPLANCKE (*Ann. Gembloux*, 39 (1933), No. 1, pp. 12-23, fig. 1).—The following results were obtained in experiments on virus diseases of potatoes: Late planting and different methods of conservation have no influence on the total percentage of diseases; different fertilizers had only a small influence on the intensity of virus diseases; and the nature of the soil is not very important as regards the symptoms of viruses.—(*Courtesy Biol. Abs.*)

Relations of *Synchytrium endobioticum* in susceptible and resistant potato varieties [trans. title], E. KÖHLER (*Arb. Biol. Reichsanst. Land u. Forstw.*, 19 (1931), No. 3, pp. 263-285, pls. 4, figs. 2).—A minute study was made of the progress of infection by *S. endobioticum* in potato varieties showing various degrees of resistance in the field by exposing young sprouts of tubers to germinating sporangia for some 17 hours, after which the sprouts were allowed to develop under a light covering of soil with periodic examination.

Both zoospores and zygotes of the parasite penetrated varieties of all degrees of resistance in the same manner and in equal numbers. In those varieties which in the field do not exhibit the stage of parasitism characterized by the presence of ripe sori, the basis of resistance is a process termed "necrogenous abortion", which ensues in the host cell following normal penetration. Contrary to the findings of Cartwright (E.S.R., 58, p. 849) that the degeneration of the parasite in resistant varieties proceeds in the absence of retrogressive changes in the host cell, it is held that the necrotic process initiated in the host cell is the cause of the parasite failing to develop and eventually undergoing disorganization without reaching the prosorus stage.

A distinction is made between necrotic abortion, characteristic of resistance, and a sort of inanition occurring in nonresistant varieties, especially in the development of the soral sporangium, which is due to occupancy of a host cell or tissue by an excessive number of the parasites. In the necrotic form of abortion, an acute and a chronic type are distinguished. The former occurs when the host cell itself dies within a few hours or days after infection, the latter when the epidermal cells adjacent to the host cell undergo disorganization in which the host cell is ultimately enveloped.

Intense infection of a growing organ in a resistant variety eventually brings about the death of a macroscopically visible area of the epidermis, which then turns brown and sloughs off. This reaction is in itself an index of resistance, although varieties of different degrees of resistance exhibit much variation in the extent to which this process goes, and especially in the length of time that a growing tissue is capable of showing the reaction. Based on the differences in inhibition or progress of soral development, five degrees of tolerance for the parasite are recognized. These are reflected in the reaction actually shown by different potato varieties to infection. The degree of tolerance is, however, only one of two components in the perceptible state of resistance or susceptibility, the other being the capacity of the tissue for overgrowth development in response to the presence of the parasite.

The application of the necrotic abortion phenomenon to practical testing of varieties is pointed out.—(*Courtesy Biol. Abs.*)

Pink rot of the potato, H. CAIRNS and A. E. MUSKETT (*Ann. Appl. Biol.*, 20 (1933), No. 3, pp. 381-403, pl. 1, fig. 1).—A survey indicated that this disease is more widespread than is generally believed. In most cases, however, the attack is so slight as to be of little or no consequence. The disease often causes heavy loss during storage under conditions of high humidity. Artificial infection at different stages of development showed that when the potato plant is well established and growing vigorously it is very resistant to the "wilt" phase of the disease.

Isolations from 14 outbreaks of the disease showed that *Phytophthora erythroseptica* Pethyb. is the normal pathogen; in one case the pathogen was *P. megasperma*. Inoculations with other species of *Phytophthora* represented in the British Isles indicated that several of these may also cause the disease. The "pinking" symptoms are a function of the tuber alone, as demonstrated by exposure of freshly wounded tubers to protoplasmic poisons, such as chloroform. The relative varietal susceptibilities of 51 potato varieties were investigated by (1) inoculation of tubers, (2) storage of tubers in contaminated soil, and (3) cropping in contaminated soil. All varieties were more or less susceptible. Satisfactory control was secured by avoiding excessively moist conditions in the field and store.—(*Courtesy Biol. Abs.*)

Depth of planting experiments for the control of Rhizoctonia on potatoes, T. M. MCCALL (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 413, 414).—Results of trials at the Crookston (Minn.) Substation indicate that shallow covering (1 to 2 in.) at planting time has considerable merit, especially when it is considered that relatively dry weather prevailed for the last two years of the test. Seed treatment was found of particular importance when the seed pieces are planted 4 in. or more deep. When dormant seed is used, however, a light to moderate coverage of the seed appeared preferable to deep planting and deep coverage.

The incorporation of contact insecticides with protective fungicides: Potato field trials, 1930-1932, M. D. AUSTIN and H. MARTIN (*Jour. Southeast. Agr. Col., Wye, Kent*, No. 32 (1933), pp. 49-58).—An account is given of field trials of various combinations of contact insecticides and protective fungicides for the control of potato deterioration and potato blight.

The following washes were found ineffective in controlling potato blight: Cottonseed, rape, or sesame oil solutions of pyrethrum extract, emulsified at 1 percent by Agral W.B., and 2 percent emulsions of the same oils; copper oleate, at 0.2 percent, in solution in cottonseed oil emulsified at 2 percent by the two-solution oleic acid method; and salicylanilide, at 1 percent, in suspension in

0.25 percent Agral 1. The following modifications of Bordeaux mixture were as effective as 10-15-100 Bordeaux mixture in controlling potato blight: 10-15-100 Bordeaux mixture with 0.75 percent concentrated sulfite lye (60° Twad.) and 0.02 percent nicotine; and 1 and 0.75 percent cottonseed oil (containing pyrethrum extract) emulsified with 10-15-100 Bordeaux mixture and 0.75 percent cottonseed oil (containing 0.02 percent nicotine) emulsified with 5-7.5-100 Bordeaux mixture. The application of the modified Bordeaux mixtures after the manner of a contact insecticide wash did not result in injury to the potato foliage. Estimations of the degree of blight control on the basis of yield of healthy tubers were found unsuitable for the detection of small differences in fungicidal efficiency. The yield of tubers from "seed" saved from potatoes washed in the two previous seasons with a contact insecticide was significantly greater than that of seed from potatoes unsprayed in the two previous seasons.

The "foot-rot" of paddy and its control, K. M. THOMAS (*Madras Agr. Jour.*, 21 (1933), No. 6, pp. 263-272, pl. 1).—The disease is due to a *Fusarium* and resembles "bakanae" of rice in Japan, but the identity of the two has not yet been established. Methods of control found successful in south India consist in the use of seed disinfectants and resistant varieties. Formalin, hot water, copper sulfate, Ceresan brand Tillantin, Uspulun, Semesan, and Granosan have produced good results under field conditions. When 41 varieties of paddy were tested under field conditions for relative resistance, a wide range of variation was noted. Details of seed treatment and varietal experiments are given.

Control of stem rot of rice by burning stubble, E. C. TULLIS, J. B. WOODS, and D. G. CARTER (*Agr. Engin.*, 14 (1933), No. 8, pp. 218, 219, figs. 2).—In studies conducted at the Arkansas Experiment Station in cooperation with the U.S.D.A. Bureaus of Agricultural Engineering and Plant Industry, it was found that burning stubble and straw on the surface of the soil killed numerous sclerotia of the rice stem rot fungus although it did not completely destroy all in the soil. It appears to be a desirable practice for the control of stem rot when used in conjunction with other recommended measures.

Curly-top resistance in sugar beets and tests of the resistant variety U.S. No. 1, E. CARSNER (*U.S. Dept. Agr., Tech. Bul.* 360 (1933), pp. 68, figs. 7).—An important advance (*E.S.R.*, 55, p. 654) in the production of a sugar beet variety resistant to curly-top disease (due to a virus transmitted by the beet leafhopper) is reported, with remarks on the economic importance of the disease and the progress of its control by cultural methods and the use of resistant varieties.

The combination of a number of strains selected for resistance, described by Carsner and D. A. Pack, produced a variety designated U.S. No. 1, which has a fair degree of resistance to curly top and is reasonably satisfactory otherwise. Agronomic trials in Idaho reported by C. E. Cormany and C. C. Lowe, in Utah and Colorado by F. V. Owen, F. A. Abegg, and W. Keller, in California by C. Price and Carsner, and in New Mexico by H. A. Elcock, demonstrated that U.S. No. 1 is markedly superior in resistance to the standard commercial brands with which it was compared. In sucrose and in purity it compared satisfactorily with standard commercial brands of sugar beets currently in general use. While it has some imperfections which make further improvement desirable, its widespread use seems advisable until a better variety is produced from the strains now being worked upon.

Field and laboratory studies on frenching of tobacco, G. M. SHEAR (*Virginia Sta. Tech. Bul.* 49 (1933), pp. 14, figs. 5).—In a field fertilizer experiment

on Hagerstown clay loam planted to Wisconsin Root-Rot-Resistant Burley tobacco, frenching developed in a well-defined area regardless of fertilizer treatments, although plats receiving stable manure or ammonium sulfate showed a smaller percentage of affected plants than adjoining unfertilized plats. Potassium sulfate and superphosphate apparently had no effect on the disease. The development of frenching in successive years on this area corresponded to periods of heavy rainfall.

In greenhouse experiments, frenching could be corrected by adding nitrogenous fertilizers to the soil or by providing conditions favoring soil aeration. Addition of absorbent cotton to the soil increased the severity of the disorder. Frenching could not be corrected by spraying foliage of diseased plants with nitrate solution or by supplying nitrates to roots extending beneath the pots of soil in which the plants were growing. The disease could not be induced in water cultures either through a deficiency of nitrates or a lack of aeration, separately or in combination. Frenching developed in soil ranging from pH 5.8 to 7.9, most rapidly between 7 and 7.5, decreasing quickly above this range and more gradually as the acidity increased. The disorder was produced in sand cultures watered with the solution leached from soil that produced frenching, suggesting that this is a toxicity disease as opposed to the view that it is a deficiency disease. Partial sterilization of soil producing frenching plants prevented the disorder where the treatment was severe enough to kill weed seed in the soil.

On some properties of the tobacco mosaic virus, I, T. FUKUSHI (Japan. Jour. Bot., 6 (1933), No. 3, pp. 381-392).—The virus was readily adsorbed by kaolin and alumina when these adsorbents were added to the extent of 10 to 20 percent to the filtered juice of mosaic tobacco leaves. Aluminum hydroxide gel was also effective, but silicious earth adsorbed it to no appreciable extent when added to the extent of 20 percent. Kaolin adsorbed the virus more readily in the filtered juice of an acid reaction, the pH of which was lower than 6. The virus adsorbed by kaolin was eluted from the latter by dilute ammonia and regained its virulence when the eluate was adjusted to a slightly acid reaction. The virus was most virulent at pH 4 to 7 and rendered less infectious by increasing the alkalinity or acidity —(*Courtesy Biol. Abs.*)

Some effects of the ordinary tobacco mosaic upon the developmental anatomy of the host plant, J. GRAINGER and R. M. HEAFFORD (Leeds Phil. and Lit. Soc. Proc., 2 (1933), No. 9, pp. 406-415, figs. 4).—The presence of the ordinary tobacco mosaic virus in leaf primordia causes some groups of cells to reach complete vacuolation before their surrounding cells. Other tissues are delayed in reaching complete vacuolation. It is suggested that a light green area will be produced on the mature leaf, if the palisade cells reach complete vacuolation before the corresponding epidermal tissue, while if complete vacuolation of palisade cells is delayed as compared with the epidermal tissue, the paper suggests that a dark green area will be formed. Such an area would have the anatomical features associated with a part which is darker green than normal. If epidermis, palisade, and spongy tissue of a part of a diseased leaf reach complete vacuolation in the same order as in a healthy leaf, a tissue is formed which has the same anatomy as a healthy organ.

Leaves which are smaller than about 3 cm in length can produce "vein-clearing" symptoms if they are directly inoculated with virus. Larger leaves show no symptoms following inoculation. They allow the virus to multiply and spread to the smaller developing leaves, which then show the characteristic mottle.—(*Courtney Biol. Abs.*)

An investigation of tomato virus diseases of the mosaic "stripe", streak group, G. C. AINSWORTH (*Ann. Appl. Biol.*, 20 (1933), No. 3, pp. 421-428, pls. 2).—Tomato virus diseases of this group occurring in glasshouses in the British Isles have been examined. Tomato mosaic has been identified with true tobacco mosaic and found not to be implicated in most of the stripe disease of the British Isles.

The symptom picture known as stripe may be due to several causes, and the diseases are distinguished as follows: Stripe when attributed to *Bacillus lathyri*, glasshouse streak when caused by a single virus (the most frequently occurring form), and streak when due to a mixed virus infection (typically tomato mosaic and potato mosaic).

The viruses involved are described and compared with spotted wilt.—(*Courtesy Biol. Abs.*)

Cork or drought spot in apples or pears, E. L. OVERHOLSER, F. L. OVERLEY, and L. L. CLAYPOOL (*Better Fruit*, 27 (1933), Nos. 10, pp. 5, 6, figs. 2; 11, p. 11).—Drought spot, according to observations by the Washington College Experiment Station, was prevalent in Anjou pears in 1928 and 1931, years of light crops, and was of less importance in 1929 and 1930, years of heavy production. In any given season trees carrying a light crop tended to have a higher percentage of injured fruits. However, in the two severe years there were extended periods of high temperature which might have been a factor because of the excessive transpiration. With small crops the reserve water supply in fruits was necessarily limited, and hence the fruit may have been overtaxed and injured. That cultural treatments may also be a disturbing factor was indicated in an Okanogan Valley orchard where practically the entire crop of apples was injured the year following deep subsoiling. Over-irrigation may also be harmful by injuring the absorbing roots.

No definite correlation was established between fertilizer treatment and drought spot, although it is believed that heavy nitrogen by stimulating vegetative development might become an indirect cause. Observations on rootstocks in affected orchards seemed to tie up *Pyrus serotina* roots with the trouble. Trees and even branches whose supporting roots were badly injured by the severe cold of 1930 showed increased injury.

The authors conclude that drought spot is most severe when a number of unfavorable factors become associated.

Results of disease control in 1932, H. W. ANDERSON (*Ill. State Hort. Soc. Trans.*, 66 (1932), pp. 175-200, figs. 6).—Apple spraying experiments showed that good control of apple scab could be secured by the use of a dry wettable sulfur obtained as a by-product of artificial gas manufacture. This type of sulfur, known as flotation sulfur, is superior in fungicidal properties to ordinary ground wettable sulfurs. Ten lb. of flotation sulfur to 100 gal. of water in the prebloom, followed by decreasing amounts in postbloom sprays, gave as good control of scab and early blotch as did liquid lime-sulfur, 2 gal. to 100 gal. of water. A full bloom spray gave added control of leaf infection with no decrease in the set of fruit. Lead arsenate and lime had some fungicidal value, estimated as about 50 percent of that of lime-sulfur. Spray injury was pronounced with lime-sulfur sprays. Injury by wettable sulfur sprays was very light.—(*Courtesy Biol. Abs.*)

An epidemic of apple scab in 1932, I. E. MELHUS and G. L. McNEW (*Iowa State Hort. Soc. Rpt.*, 67 (1932), pp. 75-84).—This is a report of a severe epidemic of scab (*Venturia inaequalis*) in Iowa, in which even orchards thoroughly sprayed with the standard schedule suffered losses estimated to be about 25 percent and some orchards gave almost a total crop failure. "Control of apple scab needs to be reinvestigated in the light of our newer knowledge."

The control of apple scab: Allington Pippin and Newton Wonder, 1932, W. GOODWIN, H. MARTIN, E. S. SALMON, and W. M. WARE (*Jour. Southeast. Agr. Col., Wye, Kent, No. 32 (1933), pp. 95-107*).—Trees of Allington Pippin sprayed four times with home-made Bordeaux mixture applications, two preblossom and two postblossom, gave 6 percent of scab-affected apples; sprayed similarly with mustard oil-Bordeaux emulsion, 17 percent of scab-affected apples. In the three control unsprayed plats the percentages of scab-affected apples were 71, 81, and 81, respectively.

Trees of Newton Wonder sprayed four times with home-made Bordeaux mixture gave 11 percent of scab-affected apples; sprayed similarly with mustard oil-Bordeaux emulsion, 47 percent of scab-affected apples. In the three control unsprayed plats the percentages of scab-affected apples were 98, 96, and 98, respectively.

Biological observations made in the plantation from time to time indicated that attacks of the disease were late in the season. For this reason it is pointed out that the extra preblossom spraying, given for the first time in 1932, cannot alone be credited with having brought about the improvement in health of the crop in Newton Wonder. Uncontrolled differences in the biological condition and previous scab history of the trees in the two plats make a comparison of the fungicidal efficiencies of Bordeaux mixture and the oil-Bordeaux emulsion almost valueless, but it is deemed noteworthy that the greater scab infection in the oil-Bordeaux plat is associated with smaller amounts of copper found to be retained on the foliage.

Field trials with lime-sulfur and Koppers flotation sulfur in apple scab control, A. B. BURRELL and R. G. PARKER (*Amer. Soc. Hort. Sci. Proc., 29 (1932), pp. 98-102*).—Scab control experiments conducted by Cornell University in five McIntosh orchards in the Champlain Valley showed good commercial control from both Koppers flotation sulfur and from lime-sulfur. Of the two materials the lime-sulfur gave somewhat the better control. Severe foliage damage noticed on two of the lime-sulfur plats was typical lime-sulfur-lead arsenate injury. Damage apparently occurred in the pink and petal fall sprays applied when the foliage was moist and remained so for some time.

Five years of experimental spraying for the control of cherry yellow-leaf on nursery stock, D. E. BLISS and G. L. MCNEW (*Iowa State Hort. Soc. Rpt., 67 (1932), pp. 178, 179*).—The authors' experiments on control of *Cocco-myces hiemalis* are summarized with the following recommendation for Iowa: Application of Bordeaux mixture, 4 lb. of burned lime (or 5-6 lb. of fresh hydrated lime) and 4 lb. of copper sulfate to 50 gal. of water once in 10 days throughout the growing season. Petroleum oil increases the efficiency of the Bordeaux. There should be clean culture of the nursery stock, including plowing under or raking up and burning of all old leaves.

Anther and stigma blight of loganberry, J. DEARNESS and W. R. FOSTER (*Canad. Jour. Res., 9 (1933), No. 1, p. 43, pl. 1*).—A new disease of loganberry, an anther and stigma blight, is reported from British Columbia. This disease is caused by *Hapalosphaeria deformans* Syd., a new fungus for North America. The fungus prevents pollination of a number of the drupelets, and a deformation of the fruit results.—(*Courtesy Biol. Abs.*)

Records of citrus scab, mainly from herbarium specimens of the genus Citrus in England and the United States, A. E. JENKINS and H. S. FAWCETT (*Phytopathology, 23 (1933), No. 5, pp. 475-482, fig. 1*).—Data obtained by the U.S.D.A. Bureau of Plant Industry and the California Citrus Experiment Station support the idea that *Sphaceloma fawcettii* originated and was present in the Orient at an early date. A Javanese specimen constitutes the earliest record (1840) of the disease. Two specimens from Bengal (one dated 1868,

the other thought to be much earlier) are the earliest records from India, and the specimen from Chosen (Korea) (1906) is probably the earliest, if not the first, record for that country. Based mainly on combined literature records the known range of citrus scab, including the form (or forms) affecting the common sweet orange, is given. Attention is called to the fact that Peltier and Frederick (E.S.R., 54, p. 852), in discussing the effects of weather on the world distribution of this disease, do not take into consideration that scab has been obtained experimentally at 24.5° and 27.5° C. (where the infection period was prolonged) as well as from 16° to 23°.—(*Courtesy Biol. Abs.*)

Hawaiian pineapple field soil temperatures in relation to the nematode *Heterodera radicicola* (Greef) Müller, H. R. HAGAN (*Soil Sci.*, 36 (1933), No. 2, pp. 83-95, figs. 2).—Because of the high temperature, at 0.25 in. depth nematodes cannot survive in fallow fields. At the 3-in. depth the soil occasionally attains a lethal temperature part of the year. The use of mulch paper increased the soil temperature by an average of 6.5° C. to a depth of 3 in., and the soil is often sufficiently heated to kill the larvae. With a dead air space beneath cellophane the temperature is greatly increased. Maximum temperatures occur from 2 until after 4 p.m. Temperatures are affected by clouds but not by trade winds. Nematode larvae probably are not transported mechanically with the first 2 in. of fallowed topsoil. Plowing and disking are aids in nematode control.—(*Courtesy Biol. Abs.*)

The principal parasitic diseases of tea and coffee in the Orient.—B. Plant parasites [trans. title], R. DU PASQUIER (*Bul. Écon. Indochine, Sect. B*, 36 (1933), Jan.-Apr., pp. 1-144, pls. 5, figs. 25).—This is the conclusion of a monograph which discusses parasitic phanerogams, algae, and fungi, and also includes sections on the importance of parasitic diseases in French Indochina, influence of environment in the development of diseases, seasons of attack by parasites in Tonkin, influence of methods of culture and treatment, and preparation and application of fungicides and insecticides, and gives keys for the determination of the pests and diseases of tea and coffee.

A "red-burn" disease of amaryllis caused by the mite *Tarsonemus hydrocephalus* Vitz. [trans. title], C. BLATTNÝ (*Gartenbauwissenschaft*, 7 (1933), No. 4, pp. 489-495, figs. 2).—To the various known forms of red-burn diseases affecting the cultivated amaryllis (*Hippeastrum*), and which include among the causal agents fungi, thrips, and possibly nematodes, another of this symptom-type is now added. It occurs especially in greenhouses and was first observed in 1930. It is caused by a mite, identified as probably *T. hydrocephalus*. Roots, bulbs, leaves, and scapes may be attacked, the characteristic injury being the formation of elongated, sunken, reddish spots. In the neck of the bulb the sheathing bases of leaves may show reddish marginal streaks of considerable area. Flower buds may be affected before emergence, as a result of which the scape is foreshortened, streaked, or spotted and the bud crippled. In extreme cases shoot growth is entirely suppressed, and the bulb may disintegrate. In greenhouse plants the symptoms appear most conspicuously from January to April, followed by a recession during the warmer, drier conditions of spring and summer.

The mites were successfully colonized in wounded bulbs, and also by insertion between intact scales at the neck of the bulb, and the typical effects were reproduced. The mites were also reared on bulb decoction agar, completing the entire life cycle. Bulbs which are stored as near 0° C. as possible, in low atmospheric humidity, and in light are much less subject to mite injury than those stored under relatively warm moist conditions and in darkness.

Fumigation with naphthalene and sulfur preparations was ineffective, as was also immersing the bulbs for 30 minutes in 0.5 percent Uspulun, but soaking for 30 minutes in water at 40° killed even the mites imbedded deep between the scales. Spraying with pyrethrum to force the liquid into the necks of the bulbs also resulted favorably.—(*Courtesy Biol. Abs.*)

Dahlia mosaic and its relation to stunt, P. BRIERLY (*Amer. Dahlia Soc. Bul.*, 9 (1933), No. 65, pp. 6-11, 19, figs. 4).—A general summary of present knowledge, including symptoms, varietal reactions, transmissibility, and control.

Preliminary studies of bluing and chlorosis of *Hydrangea opuloides* [trans. title], P. CHOUARD (*Bul. Mens. Soc. Natl. Hort. France*, 5. ser., 6 (1933), June, pp. 289-291).—These experiments show that iron, chromium, and alumina can be bluing agents, but only iron prevents chlorosis. The author employed iron in ferric form, and it did not appear to lack efficacy, although it is generally considered that ferrous iron is better absorbed by plants.

Sterilization of narcissus bulbs by immersion in silver nitrate-potassium cyanide solution in vacuo, W. NEWTON, R. J. HASTINGS, and J. E. BOSHER (*Canad. Jour. Res.*, 9 (1933), No. 1, pp. 31-36, pl. 1).—Through the use of a dye solution, evidence was obtained that a liquid disinfectant may be forced into the narcissus bulb parts invaded by nematodes and fly larvae by immersion in vacuo.

An investigation of the lethal properties of solutions against nematodes and their influence upon bulb growth led to the selection of a silver nitrate solution as a promising disinfectant, but owing to the instability of silver nitrate in the presence of chlorides and other substances in tap water and in dirt clinging to bulbs, its use had no commercial possibilities. However, when the silver salt was combined with potassium cyanide in the ratio of 1:3 by weight, an effective solution of satisfactory stability was obtained.

A solution of silver nitrate, 0.05 percent, and potassium cyanide, 0.15 percent by weight, forced into narcissus bulbs by an evacuation process, effectively destroyed bulb nematodes and bulb fly larvae without significant injury to bulb growth under greenhouse conditions.

Field tests with bulbs treated in silver nitrate-potassium cyanide solutions resulted in the reduction of infection from 26.8 to 1 percent, a 96 percent control, and no evidence of injury in the foliage or bloom was detected.—(*Courtesy Biol. Abs.*)

A *Phytophthora* disease of snapdragons, M. R. HARRIS (*Science*, 78 (1933), No. 2016, p. 152).—A serious disease of snapdragons in greenhouses in California has been experimentally shown to be due to a *Phytophthora* tentatively identified as *P. cactorum*. The disease was eliminated by using uncontaminated water and sterilizing all soil used.

Historical sketch of tulip mosaic or breaking, the oldest known plant virus disease, M. B. MCKAY and M. F. WARNER (*Natl. Hort. Mag.*, 12 (1933), No. 3, pp. 178-216, figs. 14).—Tracing the history of tulip breaking back to 1561 (Valerius Cordus), the authors bring the literature down to the present time. It is now definitely established that broken tulips are the result of a mosaic disease which constitutes a distinct menace to the culture of this popular spring flower.

Progress of pecan rosette control, J. B. DEMABEE (*Ga.-Fla. Pecan Growers Assoc. Proc.*, 27 (1933), pp. 38, 40, 42, 43, 45).—This is a review of previous work on pecan rosette and its control, with a report of the author's experiments of 1932 on control, in which favorable tentative results were obtained with zinc sulfate applied by tree injections, by spraying and dipping, and as

a fertilizer. It is felt that results of one season's work are not sufficient to warrant recommendations at this time, but it is stated that several growers are using zinc sulfate on their own initiative after inspecting or hearing of this preliminary work of 1932.

Studies on the white pocket rot or "renkon-kusare" of *Chamaecyparis formosensis* Mats. [trans. title], W. YAMAMOTO and T. ITÔ (*Formosa [Taiwan] Nat. Hist. Soc. Trans.*, 22 (1932), No. 123, pp. 433-442, pl. 1; 23 (1933), No. 124, pp. 44-54; *Eng. abs.*, p. 53).—The authors have investigated a heartwood rot of *C. formosensis*, one of the most essential trees of the virgin forest regions of Taiwan. The causal fungus is inferred to be identical with *Stereum sulcatum*, known as a heartwood rot fungus of coniferous trees in North America. The fungus attacks the trunk and twig of the living trees and causes a white pocket rot of heartwood. The optimum temperature for the mycelial growth is 22°-25° C. and the maximum is near 31°-34°. Growth is better at 16° than at 31°.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The meaning of animal colour and adornment, R. W. G. HINGSTON (*London: Edward Arnold & Co.*, 1933, pp. 411, figs. 40).—A new explanation is given of the colors, adornments, and courtships of animals, their songs, molts, extravagant weapons, the differences between their sexes, the manner of formation of their geographical varieties, and other allied problems.

Another winter's quail study re-emphasizes primary importance of environmental carrying capacity, P. L. ERRINGTON (*Amer. Game*, 22 (1933), No. 3, pp. 39, 44, 45).—This practical summary is based upon investigations previously noted (E.S.R., 69, p. 682).

[Notes on economic insects and insecticides] (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 910-918).—The contributions presented (E.S.R., 69, p. 685) are as follows: An Unreported Habit of the Seed Corn Maggot (*Hylemyia cilicrura* Rond.), by C. E. Smith (pp. 910, 911); A Spray for Insect Control in Empty Grain Bins, by E. R. McGovran (p. 911); A New Strawberry Pest [*Crypticus obsoletus* (Say)], by M. M. High (pp. 911, 912); Efficiency of Lubricating and Tar Oil Emulsions against Scurfy Scale (*Chionaspis furfura* Fitch), by L. E. Aull and R. W. Dean (pp. 912, 913); The Relative Toxicity of Some Fluorine Compounds as Stomach Insecticides, by H. H. Shepard and R. H. Carter (p. 913); The Effects of Various Commercial Calcium Arsenates on Bean Foliage, by N. F. Howard and F. W. Fletcher (p. 914); A Note on the Insecticidal Efficiency of Kerosene Extracts of Derris Alone and in Combination with Kerosene Extracts of Pyrethrum, by H. H. Richardson (pp. 914, 915); The Occurrence of *Bregmatothrips iridis* Watson in the United States, by F. F. Smith (p. 916); and The Influence of Insects in the Souring of Figs, by B. J. Howard (pp. 917, 918).

[Work in entomology at the Idaho Station] (*Idaho Sta. Bul.* 197 (1933), pp. 35-40).—The work of the year referred to includes that with insect punctures in beans by *Lygus elisus* and *L. hesperus*, the Colorado potato beetle, the destructive prune worm, leafhoppers of the apple and prune (the apple leafhopper and *Typhlocyba pomaria* McAtee) in the southwestern part of the State, beet leafhopper, development of sugar beets resistant to curly top, the silver mite on prune, pea weevil, San Jose scale, and the use of oil in codling moth and prune worm control.

[Work of the entomological division of the Puerto Rico Insular Station] (*Puerto Rico Dept. Agr. and Com. Ann. Rpt.* 1932, Spanish ed., pp. 37-39, 46-48).—Brief reference is made to the status of work with the giant toad *Bufo*

marinus L., an account of which by Leonard has been noted (E.S.R., 69, p. 70). Observations of economic insects at the Isabela Substation include a sugarcane root borer, *Diaprepes abbreviatus* L., and its egg parasites *Tetrastichus haitiensis* Cahan and *Ufens osborni* Doz.; ants; the fall army worm; several lepidopterous bean borers (*Maruca testulalis* Geyer, the lima bean pod borer, and *Fundella cistipennis* Dyar); and the pink bollworm.

[Work with economic insects at the Wisconsin Station] (*Wisconsin Sta. Bul.* 425 (1933), pp. 84-95, figs. 4).—The work of the year referred to includes that with the control of the cherry casebearer on apples by careful spraying, by J. H. Lilly and C. L. Fluke; the apple maggot, by T. C. Allen, J. A. Callenbach, and Fluke; white grubs, by K. Koch et al.; June beetles; and resistance of lighter colored peas to aphid injury and the use of larger tractors in onion spraying, both by E. M. Searls.

A new method for collecting samples of insect populations, O. A. HILLS (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 906-910, pl. 1, fig. 1).—A description is given of a new type of sampler which the author has developed for determining insect populations on wild and cultivated plants. This sampler provides an accurate means of counting all the insects present on the plants growing on 1 sq. ft. of ground. A suction pipette and a portable, electric, vacuum collector for collecting small insects from the sampler are also described.

A summary of the population of injurious insects in Kansas for 1932, R. C. SMITH and E. G. KELLY (*Jour. Kans. Ent. Soc.*, 6 (1933), No. 2, pp. 37-60, pl. 1, figs. 11).—A contribution from the Kansas Experiment Station reporting upon the occurrence of the more important insects in that State in the season of 1932 (E.S.R., 69, p. 232).

Catalogue of literature about injurious insects in U.S.S.R. in 1925-1928 (*Spisok Literaturny po Vrednym Nasekomym S.S.S.R. za 1925-1928 g.g. Leningrad: Lenin Acad. Agr. Sci. U.S.S.R., Inst. Plant Protect., 1931, pp. 95*).—This catalog includes some 2,517 references to the Russian literature on economic insects.

A precise method for determining the toxicity of mixed gases to insects, R. M. JONES (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 895-902, fig. 1).—A precise method is described for determining the toxicity of mixtures of carbon dioxide and other gases to insects. The principle underlying the method is the introduction of the vapors of volatile fumigants into a partially evacuated fumigation flask, the amounts being measured by means of a mercury manometer. The fall of the mercury in the manometer is proportional to the concentration of the gases in the fumigation flask. Air is then allowed to flow in until the mixture within the flask is reduced to atmospheric pressure. The details of the method are given and the apparatus is figured. The literature on methods for the determination of the toxicity of fumigants to insects is discussed briefly.

A list of 29 references to the literature is included.

Coal tar-kerosene emulsion and its uses as an insecticide, L. B. UICHANCO (*Philippine Agr.*, 19 (1931), No. 8, pp. 501-505).—In experimental dipping of sugarcane points for control of seed-borne insects and of pests of very young plant canes, in which a number of standard insecticides and their combinations were employed, it was found that a stock emulsion consisting of coal tar (5 l), kerosene (3 l), and ordinary laundry soap (500 g) dissolved in water (4 l) was the most profitable. Repeated trials with coal tar-kerosene emulsion in controlled experiments gave highly gratifying results. It was found to be efficient not only in killing mealybugs and other insects that ordinarily are hard to reach between the leaf sheaths and the cane stem but also in effectively

protecting cut ends of the mother plants and the eyes and developing shoots from attacks by termites and other ground-inhabiting insects.

In addition to dipping sugarcane points, for which a 1:10 dilution is employed, other uses were found for the emulsion. The practice of corralling white grubs of *Leucopholis irrorata* Chev. in sugarcane fields with an emulsion-treated trench at the time of initial appearance of infestation in the cane field was found to give absolute control. Mention is also made of its use in the control of bark borers in fruit and shade trees, control of ants in seed beds, prevention of termite damage on woody cuttings, and control of cattle foot maggot (*Booponsus intonsus* Ald.).

Water-and-oil treatment against soil-inhabiting termites and ants, L. B. UICHANCO (*Philippine Agr.*, 19 (1931), No. 9, pp. 601-603).—The author describes a method of controlling termites and ants which he has found effective and economical, as follows:

A shallow trench is dug in the soil where the termite tunnels are connected, this being filled with water until the soil is so thoroughly drenched that absorption takes place very slowly. Enough waste engine oil or kerosene to make a very thick film on the surface of the water is then poured into the trench. As the water soaks downward, the oil is drawn by surface tension under the ground and through the communication galleries of the termites into the nest.

It is pointed out that previous use of oil alone, without water, failed because the oil did not penetrate into the soil enough to reach the main termite colonies. In the use of this method against both *Termes* and the persistent *Coptotermes*, one treatment was found sufficient to destroy an entire colony. The advantages of this method include its simplicity against subterranean termites. Its application has been found to work with equal success against ground-inhabiting species of ants, with which the excavation of a trench was found unnecessary. On account of the injury caused by mineral oils to plant tissues, the method should not be employed if the nests are located near the bases of tree trunks or other valuable plants.

Casein ammonia, a practical emulsifying agent for the preparation of oil emulsions by orchardists, E. J. NEWCOMER and R. H. CARTER (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 880-887).—A method employed in the preparation of insecticidal oil emulsions, using casein-ammonia as the emulsifying agent, is described. Laboratory and large-scale tests establishing the practicability and satisfactory qualities of these home-made emulsions are described. Fruit growers in the Pacific Northwest have successfully made and used them in commercial quantity and have thereby effected considerable economy.

Farm machinery in relation to insect pest control, E. O. ESSIG (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 864-868).—In this discussion the important part that special farm equipment may play in insect pest control is pointed out.

Effect of dusts on the oriental roach, G. L. HOCKENYOS (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 792-794).—It was found that neither submergence in a dust nor suspension in a dust-charged atmosphere caused dust particles to enter the tracheae when the technic here described was employed. It is thought that loss of moisture might account for the injurious effect of dusts on some insects.

The biology of the bean thrips, S. F. BAILEY (*Hilgardia* [California Sta.], 7 (1933), No. 12, pp. 467-522, figs. 8).—This report of studies of the biology of the bean thrips is presented in connection with a list of 54 references to the literature. This species, first collected in Yuba County in 1894, is known to occur eastward to Florida and South Carolina, northward to Nevada and

Idaho, and in Mexico, Brazil, and China. It lives on many native plants and crops, of which the favorite wild host is the prickly lettuce *Lactuca scariola*, and the crops most commonly injured are beans, cotton, and pears.

Winter is passed in the adult stage, chiefly on the under side of leaves of plants remaining green and offering protection. The method of reproduction is both bisexual and parthenogenetic; fertilized eggs produce females and unfertilized eggs males. The normal sex ratio of females to males is about 2:1. About the last of March the overwintering adults migrate to prickly lettuce, sowthistle (*Sonchus oleraceus*), etc., and two generations are usually passed on these native hosts in April, May, and early June. During midsummer a generation is completed in about three weeks, so that there are from April to October six or seven generations, according to the monthly mean temperature. With the drying up of the native vegetation the bean thrips is forced to seek new food plants and thus about the last of June, or in early July, crops become infested.

"The eggs are inserted in the plant tissue and appear as minute bumps on the leaf surface. The larva has two stages, molting but once on the host. Upon maturing, the larva drops to the ground and seeks a suitable niche in the soil in which to pupate. The depth of penetration depends on the type and structure of the soil. The mature larva after molting enters a short prepupal stage in which the wing stubs become visible. The prepupa molts and then enters the true pupal stage. In the prepupal and pupal stages the insect is mobile but takes no food. After casting the pupal skin the sexually mature adult, fully winged and pigmented, finds its way to the surface via the openings in the soil. The hosts are gained by short hops and flights. During the summer months, in central California, the length of the egg stage is about 7 days, the first and second larval stages together are about 10 days, and the pupal forms pass about 5 days in the soil. The preoviposition period is about 3 or 4 days.

"The natural mortality of the immature stages is about 60 percent. There is only one known internal insect parasite of the bean thrips, namely, *Thripoctenus russelli* Cwfd. The chief predator is *Orius insidiosus tristicolor* White. Aside from these, the other natural enemies have little effect on the normal thrips population.

"The adults are active between about 50° and 117° F., the optimum range of activity being between 75° and 90°. The majority of the larvae drop from the host to the soil at a time when temperatures lethal to them are not present at the surface of the ground. Pupae seldom survive in the soil in unshaded areas if they have not penetrated at least 3 in. beneath the surface. The relative humidity range of adult activity is very wide; the optimum appears to be somewhat less than 40 percent. Both pupa and adult are comparatively susceptible to drowning."

Spraying to control the gladiolus thrips, *Taeniothrips gladioli* M. & S., in Michigan for the season of 1932, E. I. McDANIEL (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 835, 836).—At the Michigan Experiment Station contact sprays including lead arsenate and glue have been found to be more effective in controlling *T. gladioli* than those lacking such materials. The liberal use of water during dry weather and the use of fertilizer containing powdered naphthalene gave favorable indications.

A contribution to the knowledge of the western flower thrips, *Frankliniella californica* (Moulton), S. F. BAILEY (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 836-840).—The distribution, importance, and life history of one of the most cosmopolitan western thrips are reported upon.

An investigation of the *Lygus* species which are pests of beans (*Hemiptera*, *Miridae*), W. E. SHULL (*Idaho Sta. Res. Bul.* 11 (1933), pp. 42, figs. 3).—The species of *Lygus* here considered, namely *L. elisus* Van D. and *L. hesperus* Knight, are the cause of an injury to beans known as “puncturing”, the injury appearing as small holes in the seed coats, surrounded by yellow areas. This injury may be caused from the time the bean pods are about half grown until the seed coat toughens just before maturity. The feeding of the insects on the blossoms causes them to drop. In the Twin Falls area as high as 10 per cent of the beans were injured in 1929 and had to be graded as U.S. No. 2.

Twenty-eight days are required by both species for the completion of their life cycles. “The incubation period is 9 days, the first instar requiring 4 days, the second instar 3 days, the third instar 3 days, the fourth instar 3 days, and the fifth instar 5 days. Both species breed in large numbers on alfalfa and clover, and at the time of cutting or of maturing of these plants the insects migrate to other nearby plants. There are four generations in southern Idaho. The insects overwinter in the adult stage in protected places. The host plant range is very much the same for the two species, but only *L. elisus* is found on *Amaranthus retroflexus*.

“Because of the constant differences in morphological characters, and because the two insects do not interbreed, they should be raised from the varietal standing which they now have to the rank of species. A common name should be established for these insects because of their increasing economic importance. The name ‘legume bug’ is proposed for *L. hesperus* Knight and ‘pale legume bug’ for *L. elisus* Van Duzee.”

Observations on the feeding habits of the potato psyllid *Paratrioza cockerelli* Sulc. and the pathological history of the “psyllid yellows” which it produces, J. R. EYER and R. F. CRAWFORD (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 846–850, pls. 3).—Studies at the New Mexico Experiment Station of the “histological sections of *P. cockerelli* in feeding position on potato foliage show the setal sheath penetrating the mesophyll into the border parenchyma immediately surrounding the vascular bundles. The majority of feeding seems to occur in this region. Further examinations of diseased leaves and stems reveal abnormally large deposits of chromoplastids, probably starch granules, in the chlorenchyma of the leaf and in the cortex and pith of the stem.”

The relationship of aphids to the transmission of yellow dwarf of onions, C. J. DRAKE, H. D. TATE, and H. M. HARRIS (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 841–846, fig. 1).—Contributing from the Iowa Experiment Station, the authors report upon yellow dwarf, a virus disease of the cultivated onion transmitted by plant lice. “Over 50 different species of aphids have served as carriers in the experimental tests. So far as known the virus passes winter only in dormant bulbs (diseased bulbs in field and storehouse), which serve as source of inoculum at beginning of each season. Control may be accomplished by complete destruction of bulbs left in the field coupled with planting of disease-free sets and mother bulbs grown in noninfested areas, thus breaking the association of vectors and cause of the disease.”

Leaf-curl in *Zinnia elegans* at Dehra Dun, R. N. MATHUR (*Indian Jour. Agr. Sci.*, 3 (1933), No. 1, pp. 89–96, pls. 2).—The white fly *Bemisia gossypiperda* Misra and Lamba was found to be a vector of leaf curl of garden zinnias, a disease closely resembling leaf curl of cotton studied by Kirkpatrick in the Sudan (E.S.R., 66, p. 555), which is transmitted by the same white fly. Freshly emerged adult white flies fed in the nymphal stages on diseased zinnias did not transmit the disease.

Natural control of the citrus mealybug, F. R. COLE (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 855-864, fig. 1).—In this discussion it is pointed out that the introduction into California of certain natural enemies of the citrus mealybug has apparently accomplished its control and brought the population to a very low point. "The coccinellid beetle *Cryptolaemus montrouzieri* Muls. and the hymenopterous parasite *Leptomastidea abnormis* Gir. can be credited with the major part of this reduction of the citrus mealybug. The present paper gives a brief history of the pest in California and some observations on the predators and parasites present during the early outbreaks and continuing up through the year 1918. There is a rather complex interrelation of the various parasitic enemies, the most important of which are pictured on the accompanying chart."

The pineapple mealy bug (*Pseudococcus brevipes*) and wilt of pineapples, W. CARTER (*Phytopathology*, 23 (1933), No. 3, pp. 207-242, figs. 12).—In this contribution from the Hawaiian Pineapple Cannery Experiment Station, the author reports that laboratory and field experiments with the pineapple mealybug have shown it to be primarily responsible for a widespread collapse of pineapple plants, to which, because of its symptoms, the term "mealybug wilt" has been given.

"Green spotting of pineapple leaves is a localized effect at the insect's feeding point and not a typical wilt symptom. Wilt is more pronounced, however, where green spotting is present. Ants are important contributors to the vigor of a mealybug colony, and the incidence of wilt is low where these species, notably *Pheidole megacephala* and *Solenopsis geminata* var. *rufa*, are absent. . . . There is definite evidence that the mealybug's toxicity varies with the kind and condition of the insect's host plant. This is believed due to changes in the insect's secretions induced by the varied nutritional conditions afforded by the host plants.

"Mealybug wilt appears to be an insect-transmitted disease for which no closely parallel case is known. The evidence points to a nonliving toxic insect secretion of variable diffusibility as causal."

The spotting of pineapple leaves caused by *Pseudococcus brevipes*, the pineapple mealy bug, W. CARTER (*Phytopathology*, 23 (1933), No. 3, pp. 243-259, figs. 5).—Contributing from the Hawaiian Pineapple Cannery Experiment Station, the author reports that the pineapple mealybug has been found to cause two general types of spotting on pineapple leaves, one the chlorotic area commonly associated with coccid feeding and the other an entirely different type known as "green spot."

Variation in the population density of the California red scale, *Aonidiella aurantii* Mask., in a hilly lemon grove, W. EBELING (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 851-854, figs. 2).—Observations made by the California Citrus Experiment Station in a hilly lemon grove indicate that the more elevated portions of the grove have the highest average temperature, and that the population density of the California red scale (officially known as the orange scale) is a function of temperature.

Egg-laying habits and fate of eggs of the corn ear worm moth, and factors affecting them, W. J. PHILLIPS and G. W. BARBER (*Virginia Sta. Tech. Bul.* 47 (1933), pp. 14, fig. 1).—The authors report upon a study of methods conducted at Charlottesville, Va., during the years 1921 and 1922 and from 1924 to 1927, inclusive, and at Richmond, Va., from 1925 to 1927, inclusive, with a view to determining the length and seasonal limits of the oviposition period, the relative attractiveness of various parts of the corn plant to ovipositing moths, and the particular conditions of these parts which render them most attractive for oviposition. The observations, the results of which are presented

in tabular form, have shown eggs to be laid on corn plants almost continuously from the last of May to October, the number of eggs deposited on any particular plant depending on the date of planting and on the seasonal abundance of the moths. As a rule, the largest number of eggs were deposited on the plants of late plantings, the plants of midseason plantings usually receiving the fewest eggs.

"The moths prefer the moist silks for oviposition, and these silks reach their greatest attractiveness on the third day after they are formed. Early in the season, before silks appear, eggs are deposited on all parts of the plants, and even after the appearance of the silks other parts receive a few eggs. The eggs meet different fates, depending upon their location on the plant. From a study extending over a period of four years and involving 4,712 eggs in two localities and on two varieties of corn, the following facts are evident: Only a small percentage of the eggs deposited on the plants hatch. *Triphleps insidiosus* destroys large numbers of eggs on silks, stalks, husks, and tassels, and relatively few on the leaves. *Trichogramma minutum* parasitizes more eggs on the upper surface of the leaves than on any other part of the plant. Larger percentages of eggs are dislodged from the leaves and silks than from any other part of the plant. Of the comparatively few eggs deposited on the under surface of the leaves, more eggs are dislodged than meet any other fate.

"The percentage of eggs meeting any one fate was found to vary with the season. Thus, the percentage that hatched decreased as the season advanced, showing a relation to the increase in the numbers of enemies. The importance of *Triphleps* increased as the season advanced. *Trichogramma* was most effective as a parasite of ear worm eggs in the middle of June, and was less important as a controlling agency later in the season."

The New Mexico range caterpillar and its natural control, V. L. WILDERMUTH and J. C. FRANKENFELD (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 794-798).—The range caterpillar, studies of which by Ainslie (E.S.R., 23, p. 463), Wildermuth (E.S.R., 36, p. 55), and Caffrey (E.S.R., 45, p. 457) have been noted, has, after 12 years of restricted activities, again reached damaging numbers and spread over the entire cattle-range area of northeastern New Mexico. Its control through the breeding and colonization of its native egg parasite *Anastatus semiflavus* Gah. is being attempted.

New developments in the control of the cherry case bearer (*Coleophora pruniella* Clem.) in Wisconsin, J. H. LILLY and C. L. FLUKE (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 805-812).—In work by the Wisconsin Experiment Station with dormant oil emulsion sprays, which in the past successfully controlled *C. pruniella* on cherries but often failed almost entirely on apples, it was shown that this insect may be controlled on apples by thorough spraying from the ground. "Dormant oil emulsion sprays have so far shown the best control. Oil emulsions with the best spreading and wetting properties are most effective. Dormant petroleum oil emulsion sprays are undesirable because of the following tree injuries: (1) Killing of some fruit buds, thus lowering the fruit set on apples; (2) killing of entire spurs when applied in excess on both apples and cherries; [and] (3) delaying and sometimes dwarfing the development of foliage on apples. Kerosene emulsions up to 20 percent strength fail to give control. Dormant strength lime-sulfur in the late dormant stage gives promise of a practicable control with no tree injury. A tar oil wash has given good control, with no evident tree injuries. Dormant oil emulsion sprays applied in the fall gave less tree injury than the spring applications."

Investigation of naphthalene as a fumigant against the peach tree borer (*Aegeria exitiosa* Say) and sod insects.—A progress report, J. R. STEAR

(*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 903-906).—The present status of investigations with naphthalene as a fumigant against peach borers and sod insects is here described.

A general method for measuring insect populations and its application in evaluating results of codling moth control, R. E. BARRETT (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 873-879, fig. 1).—An account is given of a method of determining insect populations in the field, said to be applicable to many different insects and crops. The results, expressed as percentage increase between the initial and end populations, are presented for codling moth control on walnuts over a period of five years.

The entrance of codling moth larvae into fruit, with special reference to the ingestion of poison, P. M. GILMER (*Jour. Kans. Ent. Soc.*, 6 (1933), No. 1, pp. 19-25).—In the course of studies at the Kansas Experiment Station (E.S.R., 69, p. 240), the author found the larvae of the codling moth "to continue to reject the particles of fruit for a considerable time after they enter the fruit, larvae 24 to 48 hours later showing little sign of fruit pulp in the alimentary tract. Such larvae give indications of ingesting 'juice' as the typical brownish tinge of oxidized fruit juice is noticeable despite the absence of form elements. The larva picks up considerable foreign matter, such as carmine upon the setae, legs, and other appendages, some of which is carried into the fruit at entrance. Most of the arsenic is probably obtained by the taking into the buccal cavity of bits of skin and pulp cut from the fruit during the process of entering. These bits are afterward expelled, but a considerable portion of the foreign material remains within the mouth cavity. Carmine ingested in this manner may be demonstrated in varying quantities in approximately three fourths of the larvae within 24 hours after entrance into the fruit. The quantity ingested is such as to suggest that between one fourth and one third of the larvae would survive were the material lead arsenate."

Codling moth control experiments, 1930-33, H. JARVIS (*Queensland Agr. Jour.*, 40 (1933), No. 1, pp. 25-34).—The studies reported, the details of which are presented in tabular form, are considered to demonstrate the superiority of wet spraying over dusting as a means of control of the codling moth. The work has shown that efficient spraying, even in orchards where codling moths have been long established and are very prevalent, will give reasonable control of this pest.

Sanitary measures in codling moth control (*Indiana Sta. Circ.* 197 (1933), p. 10).—Observations by [G. E.] Marshall at the entomological field station on the Moses Fell Annex Farm have led to the estimation that it costs 11.6 c. to kill 100 codling moth larvae by spraying and 1.78 c. per 100 to destroy them by the use of self-working bands.

Can the codling moth develop on leaves alone? Other notes on the biology of *Eurrhyncha urticae* L. [trans. title], W. SPEYER (*Arb. Biol. Reichsanst. Land. u. Forstw.*, 20 (1932), No. 2, pp. 183-191, pl. 1, fig. 1).—In feeding experiments larvae of the codling moth developed to maturity when fed entirely on apple leaves, although the fourth and fifth instars were prolonged and the larvae, pupae, and adults greatly reduced in size. *E. urticae* larvae, found occasionally in the trap bands, are differentiated morphologically from the codling moth larvae for which they may be mistaken.

Second report on the efficiency of bait traps for the oriental fruit moth as indicated by the release and capture of marked adults, L. F. STEINER and W. P. YETTER, JR. (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 774-788, fig. 1).—This is a further report of work with bait traps for control of the oriental fruit moth at Cornelia, Ga., and covers the year 1932 (E.S.R., 66, p. 651; 67, p. 54).

Of 1,144 moths released on 33 different days before peach harvest in a 16-acre orchard baited with 400 traps, 76.4 percent were recovered, the females having deposited nearly 14 percent of their eggs. Of 200 released before harvest in a 37-acre orchard baited with 2,200 traps, 89 percent were recovered, the females having deposited 3.6 percent of their eggs. "Sixty to 80 percent reductions in fruit injury were obtained in these orchards despite evident migration from more than 1,000 acres of surrounding unbaited orchards. After harvest the percentage of moths recovered from releases diminished, owing in some instances to migration out of the baited orchards before oviposition began. Of 492 moths released on 17 different days after peach harvest in the 37-acre orchard only 41 percent were recaptured. The females had deposited 17.5 percent of their eggs.

"An indication of the extent of interorchard movement was obtained by the release of 1,978 marked moths in unbaited peach orchards at distances varying from 75 yd. to $1\frac{3}{4}$ miles from baited orchards. Sixteen flights of more than $\frac{1}{2}$ mile and 100 of more than $\frac{1}{5}$ mile occurred. Flights of 9,900, 9,400, 9,250, 7,250, 6,000, 5,900, and 5,300 ft. were recorded, three of them before harvest, and four of them between baited orchards. The longest was by a female which deposited eggs after her capture. Releases made on four sides of the 37-acre baited orchard, $\frac{1}{4}$ mile from the nearest traps, were followed by recoveries of 3.5 to 17 percent. Releases made on two sides of the 16-acre orchard, $\frac{1}{8}$ mile from the nearest traps, were followed by recoveries of 18.8 and 28.4 percent.

"The experiments indicate that bait trapping on a large scale, if properly conducted, should give satisfactory results. Baiting on a smaller scale may eventually become practicable if more efficient baits can be developed. The recoveries were made by experimental baits mixed among each other. Many were almost useless. They maintained an average attractiveness 65 percent less than the best in the 16-acre orchard and 40 percent less than one of the best in the 37-acre orchard."

A progress report on some insecticides used against the European corn borer, G. A. FICHT (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 747-754).—This progress report contributed from the Indiana Experiment Station offers some data relative to the reductions in European corn borer populations resulting from the application of some common insecticides to corn.

Some ecological aspects of European corn borer abundance, L. L. HUBER and J. B. POLIVKA (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 755-758, fig. 1).—This paper reviews briefly the behavior of the European corn borer in the Lake Erie region, particularly in Ontario, Canada, and in Ohio.

Fumigation with propylene dichloride mixture against *Pyrausta nubilalis* Hubn., C. B. DIBBLE (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 893-895).—Propylene dichloride mixture used at the Michigan Experiment Station at the rate of 2 lb. to 100 cu. ft. of space gave a complete kill of European corn borer naturally established in sections of cornstalk. The shortest time for positive treatment was found to be 24 hours at temperatures from 60° to 78° F., although many borers were killed in an 18-hour exposure. This information indicates the possibility of developing a method for treatment of materials (particularly truck-crop produce) prior to movement from infested to non-infested areas.

A fungous disease of the coconut leaf miner (*Promecotheca cumingii* Baly), M. S. CELINO (*Philippine Agr.*, 21 (1932), No. 7, pp. 481-490, figs. 2).—In the course of investigations, a preliminary account of which has been noted (E.S.R., 67, p. 435), the entomogenous fungus *Beauveria bassiana* was found under laboratory conditions to cause from 43 to 58 percent mortality in *P. cumingii*.

The mothproofing quality of "Eulan Neu" [trans. title], J. BELING (*Anz. Schädlingssk.*, 6 (1930), No. 12, pp. 137-141, figs. 2).—In tests conducted the author found 3 percent by weight of Eulan Neu to protect woolen goods against all stages of larvae of the webbing clothes moth.

The duration of Eulan protection against the webbing clothes moth, II [trans. title], A. HASE (*Anz. Schädlingssk.*, 9 (1933), No. 3, pp. 35-39, fig. 1).—In this second contribution (*E.S.R.*, 69, p. 391) in which the author reports upon the protection afforded by "Eulan Neu", previously tested by Beling as noted above, woolen goods to which it was applied in 1929 were still protected against moth injury 2 to 2½ years later.

A contribution to the study of the biology and of the histophysiology of *Culex pipiens* L. [trans. title], P. DE BOISSEZON (*Arch. Zool. Expt. et Gén.*, 70 (1930), No. 4, pp. 281-431, pls. 4, figs. 17).—This monographic account is presented in connection with a 10-page list of references to the literature.

Observations on the habits of flies belonging to the genus *Rhagoletis*, M. G. FARLEMAN (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 825-828).—Field observations at the Michigan Experiment Station have shown that cherry fruit flies appear on the trees earlier than in cages. The black cherry fruit fly is the first species to appear, followed by the cherry fruit fly and the apple maggot three or four weeks later. Influence of light, temperature, moisture, ripeness of fruit, and wild hosts are discussed.

Influence of host resistance and temperature during dormancy upon seasonal history of the walnut husk fly (*Rhagoletis completa* Cress.), A. M. BOYCE (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 813-819, figs. 4).—Data obtained during a 5-year biological study of the walnut husk fly at the California Citrus Experiment Station have shown that host resistance, particularly varietal susceptibility, is directly related to hardness of the walnut husk at the time of oviposition activity of the fly. Seasonal adult emergence is dependent upon the action of factors influencing the termination of dormancy, among which accumulated temperature appears to be of prime importance. A comparison of the seasonal history of the insect for the period 1928-32 is graphically presented.

Control of the walnut husk fly (*Rhagoletis completa* Cress.), A. M. BOYCE (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 819-825, fig. 1).—Laboratory and field experiments at the California Citrus Experiment Station have shown synthetic cryolite and barium fluosilicate to be the most satisfactory materials tested for the control of the walnut husk fly. The materials tested included certain arsenical, fluorine, nicotine, and copper compounds. The more important data pertaining to a few typical plot experiments conducted during the period 1928-32 are summarized in tabular form.

***Lydella nigripes* and *L. piniariae*, fly parasites of certain tree-defoliating caterpillars,** P. B. DOWDEN (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 11, pp. 963-995, figs. 6).—This is a report of studies of the bionomics and a comparison of the life histories of the dipterous parasites *L. piniariae* Htg. and *L. nigripes* Fall., puparia of which were collected in large numbers in Poland in 1928 and 1929 and studied at Budapest, Hungary, in 1929, 1930, and 1931 with a view to supplementing the work of *Compsilura concinnata* Meig., an important tachinid parasite of the gipsy and brown-tail moths which became established in the United States in 1907.

Though previously indistinguishable due to their morphological similarity, the two forms have been shown to represent distinct species, with quite different life histories and habits. *L. nigripes* attacks the gipsy and brown-tail moths, while *L. piniariae*, reared from the pine geometrid *Bupalus piniarius*

L., fails to do so. The author's experiments showed that *L. nigripes* is exceptionally polyphagous, whereas *L. piniariae*, although given almost as many host larvae to attack, is able to complete development only in *B. piniarius*, *Abrostola tripartita* Hufn., and *Tortrix dumetana* Freyer.

In a further morphological study of the two species, the immature stages were found to be almost identical, the only difference noted being in the buccopharyngeal armature of the first-instar larvae. *L. piniariae* practically refuses to attack hairy larvae, whereas *L. nigripes*, although preferring naked larvae, attacks many species of hairy caterpillars. During the summer *L. nigripes* completes three and often four generations in different host species, hibernating as a second-instar larva within the host pupa or larva. It regularly completes a summer generation in larvae of the gipsy moth, brown-tail moth, *B. piniarius*, and many other host species attacked at the laboratory. *L. piniariae*, on the other hand, rarely completes the summer generation. In two isolated instances, puparia were recovered, but deposited maggots never developed beyond the first instar in *B. piniarius*, the gipsy moth, brown-tail moth, or a number of other host species in which *L. nigripes* developed rapidly.

Although there are some marked differences in the life histories and habits of *L. nigripes* and *L. piniariae*, there are similarities in almost every phase of their life histories which show that a very close biological relationship exists between them. The obvious explanation is that they present an example of species evolution, which has not progressed far enough to bring about marked morphological changes. Since *L. piniariae* may be considered as simpler than *L. nigripes*, it is probably the older.

The fact that *L. nigripes* is not of great importance as a parasite of the gipsy moth and as effective as *C. concinnata* is considered to be due in part to its preference for hairless larvae for attack, to the fact that it is very polyphagous, and that a large percentage of the maggots deposited in late fall complete development too late to find larvae to attack and perish without reproducing.

Distribution of May-beetles (Phyllophaga) in Michigan, W. F. MOROFSKY (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 831-834).—A report is given of a study made at the Michigan Experiment Station of the distribution of May beetles in the State. Sixteen species are thus far known from Michigan.

Additional information on precipitation as a factor in the emergence of *Epilachna corrupta* Muls. from hibernation, J. R. DOUGLASS (*Ecology*, 14 (1933), No. 3, pp. 286-297, figs. 5).—Precipitation was found to be the limiting factor in New Mexico in stimulating emergence of the Mexican bean beetles from hibernation (*E.S.R.*, 59, p. 62). "Permanent emergence rarely occurs when the daily temperature is below 50° F. Rainfall is the initial stimulus, and temperature accelerates the emergence of the beetles. The temperature during rainfall and subsequent thereto is important; increasing temperature accelerates and decreasing temperature retards emergence. Appearance in the field is closely associated with emergence from the hibernation cages, and emergence can be correlated with rainfall. The peak of the overwintered beetle infestation in the field is subsequent to the peak of emergence from the hibernation cages. The stimulating effect of contact moisture is greater than that of atmospheric moisture. Where natural precipitation is excluded, beetles may be stimulated to emerge at will by supplying water to simulate rainfall after the mean temperature has risen above the threshold of activity."

Activity of blowflies and associated insects at various heights above the ground, R. A. ROBERTS (*Ecology*, 14 (1933), No. 3, pp. 306-314).—This report of a test made at Uvalde, Tex., in which jars containing meat were exposed on the ground and 15, 30, and 45 ft. above the ground, permitting the blowflies

and their associated insects to breed therein, indicates that they do so. The test was commenced in June 1930 and continued until September and repeated during the same months in 1931. The total number of insects secured in each situation decreased approximately in proportion to the increase in height. The 2,099 flies emerging were fairly evenly distributed between the four elevations. The activity of predatory beetles in the two lowest baits probably prevented the percentage of flies from being greater at these situations.

The influence of temperature on the toxicity of carbon disulphide to wireworms, E. W. JONES (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 887-892, figs. 2).—Contributing from the Minnesota Experiment Station, the author reports upon a study made of the toxicity of carbon disulfide to wireworms at various temperatures when other factors, such as diffusion and adsorption, have been eliminated. The relation of temperature to toxicity has been determined by a method in which median lethal concentrations were the basis of comparison. The results show that the median lethal concentration of carbon disulfide increases with a decrease in temperature. For every 10° drop in temperature the concentration is approximately doubled. A diagram is presented which shows the relation of temperature to the toxicity of a soil fumigant for wireworms.

Potato flea-beetle control, L. B. DANIELS (*Colorado Sta. Bul.* 400 (1933), pp. 34, figs. 5).—Experimental work commenced in 1929 has shown that "calcium arsenate, 1 lb. to 8 lb. of hydrated lime, and sodium fluoaluminate (Kalite) dusts, applied in two or three applications, give very efficient control. The first application should be made the second or third week in July, depending upon the planting date. The dusts should be applied with a crop duster at the rate of 20 to 30 lb. to the acre, depending upon the size of the potato plants. The cost of dusting with calcium arsenate will be about 75 c. per acre for each application, for materials only. The most satisfactory time for dusting potato fields is in the early morning or late afternoon. The most efficient spray is zinc arsenite, 1 lb. to 50 gal. of water. A spray boom equipped with three nozzles to the row is best for potato work. Two lower nozzles placed at a 45° angle and an upper nozzle spraying the tops cover the upper and lower surfaces of the leaves. A pressure of at least 150 lb. per square inch should be maintained.

"Potato flea beetles (*Epitrix cucumeris* Harr.) thrive best in moist, heavy soils. The annual damage from potato flea beetles reaches \$436,603 in Colorado. The quality is affected to this extent under normal conditions. The greatest number of flea beetle larvae appear about the third week in August. The first application of sprays and dusts should be applied the third week in July. The wild ground cherries [*Quincula lobata* and *Physalis lanceolata*] and buffalo-bur [*Solanum rostratum*] are hosts for developing flea beetle larvae."

Life history of the lesser grain borer, H. H. SCHWARDT (*Jour. Kans. Ent. Soc.*, 6 (1933), No. 2, pp. 61-66).—The author has found the life history of *Rhizopertha dominica* Fab. to parallel closely that of the rice weevil and to be much like that of the Angoumois grain moth. Records of the incubation period of the egg and the length of the larval period, at Fayetteville, Ark., in 1930-32 are given in tabular form.

The larval development of three barkbeetles, M. L. PREBBLE (*Canad. Ent.*, 65 (1933), No. 7, pp. 145-150, fig. 1).—A study has demonstrated the presence of three larval instars in *Ips pini* Say and *Pityokteines sparsus* Lec. and four larval instars in the eastern larch beetle. The larval instars of these three species conform satisfactorily to Dyar's Law, as shown by the close similarity

between actual and calculated head widths, the low probable error of the mean for each instar, and the low coefficients of variation. The approximate duration of the different instars is presented for *I. pini* and the eastern larch beetle as they occurred in 1929 at Fredericton, N.B.

A practical method of controlling *Dendroctonus valens* Lec., E. WALTHER (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 828-831, pls. 2).—A description is given of the method employed in injecting carbon tetrachloride in combating bark beetles, particularly the red turpentine beetle, and the results obtained.

Nomenclature of the vegetable weevil, E. O. ESSIG (*Science*, 77 (1933), No. 2008, pp. 605, 606).—The status of the nomenclature of this weevil is considered in connection with a list of 14 references to the literature.

Ingestion of poison by the boll weevil, H. J. REINHARD and F. L. THOMAS (*Texas Sta. Bul.* 475 (1933), pp. 33, figs. 6).—In studies conducted from 1924 to 1931 it was found that approximately 65 percent of the boll weevil mortality on dusted cotton occurred as a result of the accumulation of poison on the mouth parts and the accidental ingestion of poison by the weevils while crawling on the leaves, stems, or fruits of cotton. The crawling activities of weevils are quite significant with respect to weevil control, which results largely from the manner in which the poison is picked up and ingested accidentally.

To be most effective, calcium arsenate dust should be applied in a manner to cover uniformly all portions of a cotton plant. The failure of poison sprays to control the weevil seems due to the fact that the particles of poison are not usually distributed in as great abundance as when dust is applied; furthermore, the particles applied by means of spray adhere more closely to the plant surface and are not as readily picked up by the insect. The determined lethal dose of poison for the weevil approximates the total amount of poison retained on the surface of a bud as a result of the usual rate of 5 to 7 lb. per acre at which calcium arsenate is applied. The presence of dust on cotton plants retarded the crawling activities of weevils by 60 percent and reduced the number of fruits which were visited by 50 percent. The presence of dense pubescence on the stems and leaves not only retards the crawling activities of the weevils but also causes the insect to bring its beak into more frequent contact with the loose particles of poison which are retained in greater abundance by the pubescence. The development of this character may improve the best strains of cotton for production under boll weevil conditions.

A list is given of 25 references to the literature.

The practical bee guide: A manual of modern beekeeping, J. G. DIGGES (London: Simpkin, Marshall, Ltd., 1932, 7. ed., [rev.], pp. [2]+VI+306, pl. 1, figs. [201]).—A revised edition of the work previously noted (E.S.R., 62, p. 456).

The equipment and methods used in rearing the New Mexico range caterpillar parasite *Anastatus semiflavus* Gahan, J. C. FRANKENFELD and O. L. BARNES (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 799-805, pl. 1).—A detailed account is given of the equipment and methods used in rearing and handling *A. semiflavus* under controlled conditions of temperature and moisture.

Sugar cane borer control by *Trichogramma* colonization in Louisiana in 1932, W. E. HINDS, B. A. OSTERBERGER, and A. L. DUGAS (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 758-767, fig. 1).—This contribution from the Louisiana Experiment Stations is based upon work a detailed account of which has been noted (E.S.R., 69, p. 80).

Technique in the mass production of *Trichogramma*, E. G. SMYTH (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 768-774, pl. 1).—A description is given of a simple, cheap method of rearing *Trichogramma* parasites in large numbers.

The economic soundness of this means of controlling the sugarcane borer is said to be demonstrated by the success of the results obtained. The ease with which restocking of moth breeding houses is accomplished is, in addition to its simplicity, the principal advantage claimed for the method.

Two Ichneumon parasites of *Lophyrus pini* Klug., W. B. R. LAIDLAW (*Ent. Mo. Mag.*, 3. ser., 19 (1933), No. 222, pp. 124-132, pls. 2).—The author reports upon observations of *Lamachus pini caledonicus* and *Holocrema macellator cothurnata*, parasites of the pine sawfly *L. pini* in Fifeshire, Scotland. A list is given of the other parasites of *L. pini* recorded.

Biology of *Brachymeria fonscolombei* (Dufour), a hymenopterous parasite of blowfly larvae, R. A. ROBERTS (*U.S. Dept. Agr., Tech. Bul.* 365 (1933), pp. 22, figs. 5).—A report is made of studies of the life history and bionomics of a larval parasite of blowflies which is well distributed over Europe and North America and has been found in Asia.

The egg deposited in the host larva hatches on the third day, the larva maturing in warm weather in from 8 to 12 days, during which time the host larva pupates. The parasite then pupates, in which stage from 10 to 12 days are passed. It was found that parthenogenetic reproduction may also occur. The developmental period from egg to adult requires an average of 21 days at a mean temperature of from 86° to 90° F. With decreased temperatures this period increases, until at 65° the average developmental period is 35 days. At lower temperatures a portion of the brood overwinters as last-stage larvae in the host pupae. Eight generations may occur at Uvalde, Tex., a portion of the eighth overwintering.

The species is most active as a parasite of *Sarcophaga*, although it readily parasitizes species of *Synthesiomysia* and *Phormia* and is very frequently reared from species of *Lucilia* and *Calliphora*. It was rarely secured from the screw worm, but was found breeding in fly larvae in carcasses of birds, rabbits, turtles, and other small animals, about one third of such larvae at Uvalde being parasitized.

Although *B. fonscolombei* appears to be of little promise in controlling the screw worm fly, it should, because of its habit of attacking fly larvae in small carcasses which easily escape man's attention, be of value if used in conjunction with some parasite of the screw worm and with other insect enemies of blowflies to form a parasite-predator combination for reducing the blowfly population.

A list is given of 14 references to the literature.

Oriental fruit moth parasites in Michigan, J. M. MERRITT (*Jour. Econ. Ent.*, 26 (1933), No. 4, pp. 788-792).—This contribution from the Michigan Experiment Station reports upon the activity in Michigan orchards of native parasites of the oriental fruit moth, which has been under observation since 1929. Data are presented showing an average parasitism of 30 percent for a period of three years. Twenty-one species of parasites have been reared, 82 percent of which were *Glypta rufiscutellaris* Cress. Considerable seasonal variation in the fruit moth population is shown, apparently not closely correlated with the activity of the parasites.

Distribution and damage by jointworm flies in Utah, G. F. KNOWLTON and M. J. JANES (*Utah Sta. Bul.* 243 (1933), pp. 16, figs. 6).—This is an account of observations of species of Hymenoptera of the genus *Harmolita*, known as jointworm flies, which attack small grains, including the wheat straw-worm, wheat jointworm, wheat sheath gall jointworm *H. vaginicola* (Doane), rye straw-worm *H. websteri* (How.), and rye jointworm *H. secalis* (Fitch), particularly the pest first mentioned. A detailed summary by counties of the

number of samples both of irrigated wheat and of dry-farm wheat examined and the average infestation by the wheat straw-worm for 1930-32, the distribution of the wheat straw-worm, larvae and pupae, to the various joints during the same period, and a summary of data on samples examined during investigations of the wheat straw-worm for this period are given in tabular form.

The wheat straw-worm was present in all Utah counties from which wheat samples were examined. During the years 1930-32, 22.4 percent of the irrigated wheat and 30.5 percent of the dry-farm wheat examined were infested by this pest, infestations at times having reached 100 percent. "At the present time the wheat jointworm is not generally distributed in Utah; principal damage was observed in the Lake Point-Tooele area. The wheat sheath gall jointworm was extremely scarce during the period covered by the study (1930-32, inclusive), having been found in only one sample; this was taken at Manti during 1932. The rye straw-worm was found in several northern Utah localities, with infestations averaging less than 10 percent. Infestation percentage from the rye jointworm was negligible.

"Parasites played a small part in the control of wheat straw-worm. *Ditropinotus aureoviridis* Cwfd. apparently was an important factor in the control of the wheat jointworm in Tooele County. Control measures for these insects consist principally of deep plowing of stubble fields soon after harvest, planting at least 65 to 75 yd. away from straw left over from the previous season, [and] destruction of volunteer wheat and of straw stacks before emergence time in the spring."

A list is given of 18 references to the literature.

On the morphology and life history of *Aproctonema entomophagum* Keilin, a nematode parasite in the larvae of *Sciara pullula* Winn. (Diptera—Nematocera), D. KEILIN and V. C. ROBINSON (*Parasitology*, 25 (1933), No. 3, pp. 285-295, pls. 2, figs. 2).—This is an account of a nematode parasite of the larva of a fungus gnat, *S. pullula*.

Further investigations of the tenacity of *Nosema apis* [trans. title], A. BORCHERT and H. POLZIN (*Berlin. Tierärztl. Wchnschr.*, 49 (1933), No. 13, pp. 193-196).—The authors have found the spores of *N. apis* from diseased bees to remain infective for normal mature bees after 93 days in water and after 92 days in smears on glass slides. The spores were not destroyed by 0.2 percent water solution of chinisol (quinosol) in 72 hours but were by a 0.5 percent formaldehyde (=1.25 percent formalin) solution in 72 hours.

A list is given of 13 references to the literature.

ANIMAL PRODUCTION

International directory of animal husbandry institutions, A. BRIZI (*Les Institutions de zootechnie dans le monde. Roma: Inst. Internatl. Agr.*, 1933, pp. XVI+325).—This is an international directory of animal husbandry institutions, showing the personnel and activities of each. Some of the data are given in five languages.

[Investigations with livestock in Idaho] (*Idaho Sta. Bul.* 197 (1933), pp. 17, 18, 27, 28, 48-50, 53, 54).—Results are reported of studies with beef cattle, sheep, and swine dealing with the improvement of sweetclover pasture, the use of alfalfa hay or leaves in rations for fattening pigs and brood sows, the condemnation of slaughter pigs due to retained testicles, and the best use of home-grown feeds for fattening steers and lambs at the Caldwell and Aberdeen Substations.

The work with poultry includes reports on oyster shell v. native calcites as a source of calcium for growing chicks and in laying rations, effect of different levels of calcium and phosphorus on the composition of blood and bone, pea meal as the vitamin A supplement to poultry rations, a study of the blood as an index of health and body functions, alfalfa as a vitamin supplement and its effect upon yolk color, artificial incubation of turkey eggs, comparison of conditions provided by electric and coal brooders, and maintaining the quality of summer eggs by the use of a home-made humidifier.

[Pasturing experiments with livestock in Montana], D. HANSEN, A. E. SEAMANS, and D. V. KOPLAND (*U.S. Dept. Agr., Tech. Bul. 353 (1933), pp. 22-25, 34-39*).—Data are reported from the Huntley, Mont., Field Station in cooperation with the Montana Experiment Station on experiments in pasturing irrigated crops by hogs and sheep; alfalfa, field corn, and rape for hogs; sweet-clover and field corn for sheep; and pasturing annual and perennial dry-land crops by hogs.

[Investigations with livestock in Wisconsin] (*Wisconsin Sta. Bul. 425 (1933), pp. 1-5, 7-9, 10, 17-21, 22, 113-120, 121, figs. 9*).—Nutrition studies include notes entitled Irradiated Milk Proves Worth in Nutrition Tests, by H. Steenbock (pp. 1-5); Xanthophyll Has No Vitamin A Value, by E. B. Hart, O. L. Kline, and M. O. Schultze (p. 7); "Mineralized" Milk Produces Excellent Growth, by Hart, Steenbock, C. A. Elvehjem, A. R. Kemmerer, J. M. Fargo, and E. C. Van Donk (pp. 7-9); Rock Phosphate as Mineral Source in Animal Rations, by P. H. Phillips, G. Bohstedt, Hart, J. G. Halpin, and C. E. Holmes (pp. 118-120); and Calves Need Vitamin D, by I. W. Rupel, Bohstedt, and Hart (p. 121).

Swine studies report data on Scabbed Barley Satisfactory for Hogs when Used as Small Part of Ration, by B. H. Roche, Bohstedt, Fargo, Rupel, J. G. Dickson, and Halpin (pp. 113, 114); The Effect of Varying Amounts and Kinds of Fiber in Rations of Pigs, by Bohstedt and Fargo (pp. 114-116); and Best Methods of Using Skim Milk in the Hog Ration, by Bohstedt, Fargo, and W. M. Beeson (pp. 116-118).

The work with poultry includes information entitled Cooking Poultry Ration Destroys Necessary Vitamins, by Hart, Elvehjem, J. A. Keenan, Kline, Halpin, and Holmes (pp. 17, 18); Vitamin G Inadequate in Many Rations for Laying Hens, and Compare Vitamin D Supplements in Laying Ration, both by Halpin, Holmes, and Hart (pp. 18, 19); Soybean Oil Meal Proves Effective as Partial Source of Protein in Poultry Ration (p. 20), Yeast Does Not Improve a Good Chick Ration (pp. 20, 21), Chicks Need Salt but Not Too Much (p. 21), and Feeding Mineral Oil Will Not Change Color of Egg Yolks (p. 22), all by Halpin and Holmes.

Factors influencing the vitamin-B and vitamin-G content of hays, C. H. HUNT, P. R. RECORD, W. WILDER, and R. M. BETHKE (*Ohio Sta. Bimo. Bul. 163 (1933), pp. 104-106*).—Chemical and biological analyses of different hays showed that as the plant matures the protein and vitamins B and G decreased, and the crude fiber increased. These changes are an indication of reduced quality. A high vitamin-G content was correlated with a high protein content and a good green color, provided the influencing factors were the same during the curing process. In hays exposed to rain during curing, more vitamin G and color were lost than protein. A comparison of some Colorado and Ohio alfalfa meals did not show any significant difference in the protein or vitamin G content of the products.

Studies on changes in vitamin content of alfalfa hay, E. DOUGLASS, J. W. TOBISKA, and C. E. VAIL (*Colorado Sta. Tech. Bul. 4 (1933), pp. 68, figs. 14*).—

This study was undertaken to determine the changes in the vitamin A, B, C, and G content of alfalfa hay due to differences in environmental conditions and to variations in maturity at the time of cutting. No work was done on the vitamin D content because it was assumed that the abundant sunshine in the State supplied this factor.

It was found that hay cut at the early-bloom stage usually contained more vitamin A than when cut at other stages if the method of curing was comparable. Curing hay in diffused light was more beneficial to the vitamin A content than curing in direct sunlight. A comparison of different cuttings and different stages of maturity showed that in two successive years the largest quantities of vitamin A were found in the early-bloom stage of the third cutting. Exposure to 1 in. of rain definitely lowered the vitamin A content, but the damage was considerably less for hay in the cock than for hay in the swath. Colorado hays showed a higher A content in 1931 than samples of alfalfa grown in certain other States.

The results of the B studies indicated that exposure to 1 in. or more of rain increased this vitamin content provided the hay was dried immediately. There were also indications of a slight diminution in vitamin B with increasing age of the plant. Samples cured in diffused light gave an appreciably higher value for vitamin B than those cured in direct sunlight. The B content of the hay decreased with each succeeding crop. Excessive molding of hay during the curing process decreased the B content. Colorado hays had a somewhat higher B content than some hays from other States. There were indications that the B factor itself or some other ingredient of alfalfa had an adverse effect upon the kidney and bladder of many of the experimental animals.

While green alfalfa had an abundance of vitamin C, this property of the plant was entirely lost when it was cut and cured for hay.

Observations indicated that when the B value of the hay was diminished by adverse treatment, the G value was increased. However, there was not sufficient evidence to make this observation conclusive. It was definitely shown that vitamin G was rather stable and uniform in distribution in Colorado hays. The ranges in content for this vitamin were from 3 to 5 units per gram of good hay.

The comparative feeding values for livestock of barley, oats, wheat, rye, and corn, E. W. CRAMPTON (*Canada Natl. Res. Council Rpt. 28 (1933), pp. 107*).—This is a review and analysis of published material relating to the comparative value of barley, oats, wheat, rye, and corn for feeding to the various classes of livestock.

Silos, ensilage, and silage, T. Y. WATSON (*Kenya Dept. Agr. Bul. 26 (1932), pp. VI+29, pls. 2, figs. 2*).—The construction of silos, the making of silage, and the feeding of silage as a means of supplying succulent feed to livestock in Kenya are discussed.

The manufacture and utilisation of silage, W. J. SPAFFORD (*So. Aust. Dept. Agr. Bul. 274 (1932), pp. 51, figs. 25*).—The advantages of storing forage as silage, the changes occurring in plants during the production of silage, methods and crops used in the making of silage, types and capacities of silos, stack silage, and utilization of silage by different classes of livestock are described in this bulletin.

Types and varieties of corn for silage, W. B. NEVENS (*Illinois Sta. Bul. 391 (1933), pp. 65-124, figs. 7*).—A study covering a period of 6 years was conducted to compare the value for silage of large, late-maturing varieties with earlier varieties of corn and prolific with nonprolific types, and to determine the optimum percentage of dry matter in corn at the time of ensiling and a

method for reducing or preventing the spoilage which occurs on the surface of silage.

The grain varieties of corn proved to be superior for silage purposes to the late-maturing varieties. While the late-maturing varieties produced a greater weight of silage corn per acre, the grain varieties gave a greater yield of dry matter. Samples taken at weekly intervals in the field showed a rapid increase in yield of nutrients during August and September. The corn reached its maximum fresh weight before the development of the maximum dry matter content, and harvesting in August or early September would sacrifice a large part of the feeding value. The ears of two late-maturing varieties contained approximately 35 percent of air dry matter, while the ears of four grain varieties contained 47 percent of air dry matter of the corn. Observations on the quality of silage produced under a wide range of moisture conditions showed that the most satisfactory stage of development at which to ensile corn was when it reached a dry matter content of 30 percent.

Digestion trials showed that Reid Yellow Dent had the highest digestibility, Virginia Horsetooth next, and Cocke Prolific the lowest. The three varieties ranked in the same order in percentages of dry matter and in metabolizable energy values. As the sole feed for sheep, the Cocke variety was unpalatable. In feeding trials with dairy cattle Reid silage, fed in connection with clover hay, proved to have the highest value, followed by Virginia and Cocke. Silage containing large amounts of water may limit the intake of nutrients to such an extent that maximum milk production cannot be attained. There was apparently a direct relationship between the water content of corn at the time it was ensiled and the percentage of acidity in the silage. The acid content of silage made from immature corn may be very high. Silage made from corn cannery refuse had a digestibility comparable to Reid silage, but because of its low dry matter content its feeding value was below that of Reid silage. The cannery refuse silage had a high acid content and when given as the only feed was sometimes unpalatable. An effective method of reducing losses on the surface of silage consisted of covering with a good quality of roofing material when the filling was completed and weighing uniformly with a weight amounting to from 10 to 15 lb. per square foot.

Appended is a very complete review of the literature on silage.

Commercial feeding stuffs, H. R. KRAYBILL ET AL. (*Indiana Sta. Circ. 195* (1933), pp. 24, fig. 1).—This is a condensed report of the usual commercial feed inspection for the year 1932 (E.S.R., 67, p. 590), including definitions of feeding stuffs and average analyses of common cereals and by-product feeds.

Commercial feeding stuffs, L. S. WALKER and E. F. BOYCE (*Vermont Sta. Bul. 351* (1933), pp. 48).—This is the usual report (E.S.R., 68, p. 655) of the analyses for the protein, fat, and fiber content of 2,235 samples of feeding stuffs collected for official inspection during December 1932.

Cattle feeding: Winter steer feeding, 1928-29, 1929-30, 1930-31, J. H. SKINNER and F. G. KING (*Indiana Sta. Bul. 371* (1933), pp. 15).—Continuing these studies (E.S.R., 61, p. 664), the results reported in part 1 showed that replacing one third of the shelled corn in a ration of corn, cottonseed meal, clover hay, and corn silage with medium-ground oats improved the fattening ration for 2-year-old steers when measured either by the nutritional or economic standard.

The results reported in part 2, based on 3 trials with 2-year-old steers, showed that medium-ground and coarse-ground oats were more efficient and more profitable as a feed for cattle than whole oats. However, fine-ground oats were not as satisfactory as whole oats. These results were obtained with a

ration of corn and oats 2:1, clover hay, and corn silage. The preparation of the oats did not affect the appetite of the cattle. The rate of gain, feed required per unit of gain, and finish of the animals was in favor of the medium-ground or coarse-ground oats. On the basis of the net return the methods of preparing oats ranked as follows: Coarse-ground, medium-ground, whole, and fine-ground.

Maintenance of beef cows for calf production, L. VINKE and W. F. DICKSON (*Montana Sta. Bul.* 275 (1933), pp. 35, figs. 10).—Continuing this study (E.S.R., 55, p. 562), the results of 7 winters' experiments with beef cows are reported.

It was found that the amount of winter gain or loss in weight of breeding cows should be governed so as to maintain the weight and strength of mature cows from year to year. The gains on grass were materially cheaper than gains in winter feed lots. There apparently was no difference in the vitality or thrift of calves from cows that lost weight during the winter as compared with cows that gained weight. The amount of protein in the winter ration of breeding cows had no effect on the weights of calves produced if the cows were maintained in a thrifty condition. While cows could be wintered on almost any kind of ration, meager rations cannot be extended too long or into the calving period without danger of severe loss in weight or death of the cows. Calves produced by cows suffering heavy winter losses were normal at birth, but did not develop normally unless green grass or other feed was available to stimulate milk flow. Under plains conditions beef cows reached their "prime of life" between the ages of 6 and 8 years. Summer losses in weight of heavy cows were reflected in larger calves at weaning time. Dry cows made an average gain of 268 lb. more during the summer than wet cows, but this was not true of cows that lost their calves at birth. It was found that breeding cows to drop their calves before May 15 resulted in maximum growth and development of the calf before weaning time.

A ration of 1 lb. of cottonseed cake per head daily with all the barley, wheat, oat, or rye straw they would consume brought cows through the winter period in good condition and no resulting bad effect. When all factors were considered 1 lb. of cottonseed cake was equal to 4.5 lb. of alfalfa hay or 5.5 lb. of corn fodder for supplementing a straw ration. Replacing part of a ration of corn fodder with straw resulted in practically the same winter gain and reduced the cost of feeding 20 percent. While replacing half of the straw with alfalfa hay materially increased the winter gains, it also increased the feed cost 47 percent. When fed with alfalfa and straw, corn silage produced nearly three times as much winter gain as an equal amount of dry matter in corn fodder, and when fed with straw alone produced 35 percent more gain than corn fodder. Over a 5-year period it was found that oat hay was the most efficient single roughage, followed in descending order by alfalfa, sweetclover, bluejoint, and corn fodder. Where natural brush shelter was available for wintering cows, it was equal to expensive shed equipment and reduced the cost of maintenance.

A comparison of feeder lambs, T. B. KEITH and W. L. HENNING (*Pennsylvania Sta. Bul.* 288 (1933), pp. 12, figs. 5).—Continuing this study (E.S.R., 66, p. 257), a comparison was made of the value of 223 fine wool, 165 native mutton, 223 choice western, and 58 medium western lambs as sources of feeder lambs between 1928 and 1932. The feed required per unit of gain was greater for the native fine wool than for either the native mutton or western feeder lambs. Choice western feeder lambs made approximately 38.6 percent higher average daily gains than native fine wool and 23.6 percent higher gains than native mut-

ton lambs. It was thought that the lower consumption and utilization of feed by the native fine wool lambs might be attributed to their heavier and denser fleeces. The percentage of culls among native fine wool, native mutton, and choice western lambs was 14, 9.9, and 1.5, respectively. The six lots of native fine wool lambs had an average dressing percentage of from 40.5 to 46.6, four lots of native mutton lambs from 47.1 to 49.6, and the six lots of choice western lambs from 46.8 to 50.

Effect of fluorine on the nutrition of swine, with special reference to bone and tooth composition, C. H. KICK, R. M. BETHKE, and B. H. EDGINGTON (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 11, pp. 1023-1037, pl. 1, fig. 1).—This investigation at the Ohio Experiment Station, consisting of two separate experiments, was conducted to compare the effects of fluorine, in the forms of chemically pure sodium fluoride and the natural phosphate mineral, in the nutrition of swine, especially the effect on bone and tooth composition. Experiments were run for 144 and 160 days, using eight and six lots of eight pigs each, respectively. At the end of the experiment the animals were slaughtered and the femurs, kidneys, and teeth were used for physical and chemical examination.

When the ration contained approximately 0.03 percent or more of fluorine from rock phosphate or sodium fluoride, the growth and feed consumption were impaired and the efficiency with which the ration was utilized was lessened. The femurs were characterized by an increase in the diameter of the shaft, a loss of normal color and luster, the presence of exostoses, and a decreased breaking strength. These changes were more pronounced as the fluorine content of the ration increased. The bones contained normal percentages of ash, calcium, and phosphorus, increased amounts of magnesium and fluorine, and decreased amounts of carbon dioxide. The contents of magnesium, fluorine, and carbon dioxide were directly related to the fluorine content of the ration. The size of the rami of the mandibles was increased by fluorine feeding, due to an increase in the size of the marrow cavity, and the type of marrow in the cavity was changed. Feeding excessive amounts of fluorine over long periods softened the teeth of pigs, but the percentages of ash, calcium, phosphorus, magnesium, and carbon dioxide were not significantly affected. The fluorine content of the teeth was directly proportional to the amount fed.

The fluorine from rock phosphate and sodium fluoride had the same physiological effect on swine, except that rock phosphate caused a nephritis with resulting induration of the kidney in varying degrees when the pigs received approximately 1 percent or more of this mineral in the ration.

The value of permanent pasture for fattening pigs, E. H. HOSTETLER and J. E. FOSTER (*North Carolina Sta. Bul.* 286 (1933), pp. 14).—Continuing this study (*E.S.R.*, 65, p. 165), it was found that pigs receiving a full feed of protein supplement on pasture ate 4 percent more concentrates daily than did pigs in dry lot, but gained 5 percent more rapidly and required 2 percent less concentrates to produce a unit of gain. A comparison of pigs fed in dry lot and on pasture showed that one-half acre of pasture replaced 138 lb. of concentrates. When no charge was made for pasture, the pigs cost 1 percent less per unit of gain, returned 1 percent more per bushel of corn fed, and the return per pig over feed cost was 4 percent greater than for pigs in dry lot. Pasture properly supplemented with protein brought pigs to market weight 6 days earlier than similar pigs in dry lot.

Pigs receiving a limited supply of protein on pasture were not so economical as either dry-lot pigs or pigs full-fed protein on pasture, even though no charge was made for the pasture. There was no significant difference in the time

required for pigs to reach market weight between a group in dry lot and a group in which pasture replaced one half of the protein supplement in the ration. When a full allowance of protein supplement was fed on pasture, pigs gained 7 percent faster than similar pigs on a limited protein intake. The limited protein group on pasture consumed 20 percent more grass and 7 percent more concentrates per unit of gain than those receiving a full feed of protein. With a limited supply of protein 83.7 lb. of grass replaced only 5.5 lb. of concentrates. The average daily feed consumption of the two groups on pasture was practically the same.

The use of the chick in vitamin B₁ and B₂ studies, O. L. KLINE, J. A. KEENAN, C. A. ELVEHJEM, and E. B. HART (*Jour. Biol. Chem.*, 99 (1932), No. 1, pp. 295-307, figs. 6).—A ration has been developed at the Wisconsin Experiment Station which can be made deficient in vitamin B₁ or B₂, respectively, by different heat treatments. This diet, known as Ration 240, is composed of yellow corn, middlings, casein, salt, cod-liver oil, and calcium carbonate 58:25:12:1:2:2. When the ration was autoclaved at 120° F. and 15 lb. pressure for 5 hours and then fed to chicks, the birds developed severe polyneuritis in about 8 days. Adding air-dried yeast or a vitamin B₁ supplement corrected this deficiency. When used as a basal ration for vitamin B₁ studies, the above-named ration was usually supplemented with vitamin B₂ in the form of 4 percent of autoclaved yeast. When Ration 240 was heated dry at 95° to 100° for 144 hours and then fed to chicks they developed pellagra at about 3 weeks of age. The addition of autoclaved yeast made this ration complete.

A study of the heat stability of the vitamin B factors required by the chick, C. A. ELVEHJEM, O. L. KLINE, J. A. KEENAN, and E. B. HART (*Jour. Biol. Chem.*, 99 (1932), No. 1, pp. 309-319, figs. 4).—Continuing the above study, it was found that the vitamin B₁ in yeast and in Ration 240 was completely destroyed by autoclaving and inactivated to a great degree by heating moist at 100° F. for 24 hours. However, the vitamin B₁ potency was not reduced by heating dry at 100° for 24 hours. The rate of decrease of potency in B₁ in the presence of moisture declined as the pH value increased. After 24 hours' heating at 100° there was no noticeable destruction of B₂ in Ration 240. However, half the potency was lost after 72 hours and the destruction was practically complete after 144 hours' heating. Dried bakers' yeast, containing about 25 times as much vitamin B₂ as Ration 240, lost half its potency after heating dry for 144 hours.

It was found that chicks do not require the heat-labile B₃ or any other factor that is destroyed by heating at 100° or below for 24 hours.

Irradiation of chicks, M. W. MILLER, G. E. BEARSE, and G. CUSHING (*Poultry Sci.*, 12 (1933), No. 1, pp. 21, 22, fig. 1).—At the Western Washington Experiment Station, four lots of 15 White Leghorn chicks each were fed the same basal ration in batteries in a room from which sunlight was excluded. In addition to the basal ration, lot 1 received 0.125 percent of fortified cod-liver oil; lot 2, 7 hours of irradiation with a CX Mazda lamp with an aluminum reflector at a distance of 10 in.; lot 3, 14 hours of irradiation; and lot 4, the basal ration only.

Satisfactory growth was made by all groups except lot 4. During the 8 weeks of this test, one chick in lot 3 and three chicks in lot 4 died. Line tests indicated normal calcification in lots 1 and 3, slight rickets in some birds in lot 2, and severe rickets in all chicks in lot 4. Ash analyses showed relatively high average ash percentages for lots 1, 2, and 3.

These results show that the 60-w CX Mazda lamps, while not a rich source of ultraviolet light, will prevent rickets if chicks are exposed over 7 hours at a distance of 10 in.

The antirachitic value of sardine oil for growing chicks, F. E. MUSSEHL and C. W. ACKERSON (*Poultry Sci.*, 12 (1933), No. 1, pp. 31-33, figs. 2).—A basal ration complete in all known essentials except the antirachitic factor was fed to seven lots of chicks at the Nebraska Experiment Station. This ration was supplemented in various lots with such vitamin D supplements as cod-liver oil, direct sunshine, sardine oil, and different proportions of sardine oil and corn oil.

The results indicate that sardine oil contained appreciable amounts of the antirachitic factor, but not so much as the cod-liver oil used in these tests. When the sardine oil was fed at a 0.5 percent level it promoted good calcification in chicks in this study.

Fish oils as a source of vitamin D for growing chicks, J. S. CARVER, A. BRUNSTAD, J. L. ST. JOHN, F. W. FRASIER, and W. ATHOW (*Washington Col. Sta. Bul.* 284 (1933), pp. 32, figs. 11).—The results of this study are based on experiments with 60 lots involving 980 individual chicks. The tests were all conducted under controlled experimental conditions to determine the levels of several fish oils that should be fed to growing chicks in order to give complete protection from rickets.

When the Washington State College all-mash biological ration was fed, several samples of sardine oil and pilchard oil fed at 0.25 and 0.5 percent levels did not protect chicks from rickets, but at 1 percent levels both types of oil afforded complete protection. A concentrated cod-liver oil fed at a one eighth of 1 percent level with the above ration afforded complete protection.

The Washington State College commercial chick ration, which contained from 0.8 to 1 percent of phosphorus, did not require the addition of any supplemental mineral containing phosphorus if the meat scrap used had from 25 to 30 percent of total ash. However, this ration required the addition of 1 percent of oyster shell flour plus the antirachitic factor to promote maximum growth and calcification. With a calcium level of from 1 to 1.8 percent and a phosphorus level of from 0.8 to 1 percent excellent results in growth and calcification were obtained. When the ration used contained the necessary amounts of calcium and phosphorus, the addition of 0.5 percent of biologically tested sardine oil prevented the occurrence of rickets.

Transmission of ultra-violet light through window glass, A. R. WINTER and F. L. BISHOP (*Poultry Sci.*, 12 (1933), No. 1, pp. 9-16, fig. 1).—This study was undertaken to determine the transmission of biologically effective ultra-violet light through different thicknesses of Lustraglass, two different brands of ordinary window glass, and one thickness of quartzlite glass. The requirements of growing chicks for vitamin D as supplied by sunlight and a mercury quartz lamp and the biological transmission of glass as compared with energy transmission were also studied, using 58 lots of day-old Leghorn chicks as experimental animals.

The two brands of ordinary window glass, quartzlite glass, and double strength Lustraglass (0.124 in. thick) transmitted very little biologically effective ultraviolet light. Lustraglass of the following thicknesses, 0.124, 0.087, 0.074, 0.06, and 0.05 in. was 26, 39, 45, 49, and 60 percent, respectively, efficient in biological transmission.

Normal growth and bone development of chicks resulted from an average daily exposure of 16 minutes to midday clear or slightly cloudy November sunlight in the region of Columbus, Ohio. An exposure of 8 minutes produced nearly normal results. During February and March 25 minutes' exposure to sunlight, 40 percent of which came through dense clouds, produced normal results, and 12.5 minutes brought about nearly normal results. An average dose of 2.4 μ w.-hr. of sunlight of wave lengths below 3,130 A was sufficient

to prevent rickets and to produce normal growth. During December, the minimum period of such sunlight, the available microwatt hours per day were 16 times the amount required.

Effect of calcium carbonate and calcium sulphate on bone development, H. W. TITUS, E. McNALLY, and F. C. HILBERG (*Poultry Sci.*, 12 (1933), No. 1, pp. 5-8).—In a study by the U.S.D.A. Bureau of Animal Industry, Rhode Island Red day-old chicks were divided into two series of seven pens and were fed diets in which the calcium-phosphorus ratios ranged from about 3.5:1 to 5.7:1. In one series a mixture of calcium carbonate and steamed bone meal was used as the mineral supplement, while in the other series the mixture was made of calcium sulfate and steamed bone meal. In both series the calcium content varied from approximately 2.7 to 3 percent.

As the calcium-phosphorus ratio increased, it was found that the average ash content of the femur and tibia of the chicks gradually decreased in the pens receiving calcium carbonate but had a slight tendency to increase in the pens receiving calcium sulfate. It is concluded that experimental evidence now available shows that there is no calcium-phosphorus ratio which is optimum for all diets for growing chicks. The metabolic acid base balance appears to be one of several factors influencing bone development.

Ground soybeans as a protein supplement for growing chicks, A. E. TOMHAVE and C. W. MUMFORD (*Delaware Sta. Bul.* 183 (1933), pp. 24, fig. 1).—Continuing this study (*E.S.R.*, 66, p. 566), it was concluded that ground soybeans supplemented with bone meal could not be used to replace all of the animal protein in a ration for growing chicks without affecting the growth, mortality, and feed requirements per unit of gain. However, when supplemented with bone meal the ground soybeans could replace one third of the meat scrap without affecting these factors. Ground soybeans were less palatable than meat scrap containing 55 percent protein. When a unit of protein in ground soybeans and in meat scrap cost the same there was no advantage in feeding the vegetable protein, but when the cost was 65 percent or less for the vegetable protein it could be used economically to replace one third of the meat scrap.

The effect of ground soybeans on the cold storage quality of eggs, A. E. TOMHAVE and C. W. MUMFORD (*Poultry Sci.*, 12 (1933), No. 1, pp. 37-41).—In tests at the Delaware Experiment Station, eggs produced by hens receiving rations containing varying amounts up to 10.4 percent of ground soybeans were placed in cold storage for periods of 4, 6, and 9 months. The eggs were produced during the month of May, and no egg was more than 4 days old on the date of storage.

Practically no difference was found in the keeping quality of eggs produced from rations containing as high as 10.4 percent of ground soybeans and from rations containing no soybeans.

Relation between body weight and age at sexual maturity, F. A. HAYS (*Poultry Sci.*, 12 (1933), No. 1, pp. 23-25, fig. 1).—An analysis was made of a total of 820 Rhode Island Red pullets bred for egg production and hatched at 11 weekly intervals from March to June at the Massachusetts Experiment Station. The birds were grouped into 17 age classes of 10 days each and into 10 body-weight classes with a 0.5-lb. range. The minimum age at sexual maturity was 150 days and the maximum 319 days. The weight at sexual maturity ranged from a minimum of 3.5 lb. to a maximum of 9 lb. The correlation between age and body weight was 0.468 ± 0.0184 . The data were interpreted as evidence that the significant variations in body weight at first egg were entirely due to differences in age. The data also indicated that body weight was an explicit function of age between the limits of 150 and 319 days.

Relation of weight at sexual maturity to annual egg production, F. A. HAYS (*Poultry Sci.*, 12 (1933), No. 1, pp. 25, 26).—The records of 2,091 Rhode Island Red pullets in the flock at the Massachusetts Experiment Station were divided into class intervals of 10 for annual egg production and class intervals of 0.5 lb. for body weight at sexual maturity. The range for production lay between 31 and 300 eggs and for body weight between 3 and 9.5 lb. The correlation between body weight taken at first pullet egg and annual production was negative, amounting to 0.3721 for the birds studied. Its squared value was 0.1385, which was interpreted to mean that approximately one seventh of the variability in annual egg production could be attributed to variability in body weight at first egg.

Production of Ohio Record of Performance flocks, G. S. VICKERS (*Poultry Sci.*, 12 (1933), No. 1, p. 20).—The results of the Ohio Record of Performance flocks for the years 1916-27 to 1930-31 are presented in tabular form.

The effect of age and holding temperatures on hatchability of turkey and chicken eggs, H. M. SCOTT (*Poultry Sci.*, 12 (1933), No. 1, pp. 49-54).—A series of experiments was undertaken at the Kansas Experiment Station to determine the effect of age at setting and the influence of the temperature during the holding period on fertile eggs of Bronze turkeys and White Leghorn chickens.

The hatchability of the Leghorn eggs was not materially reduced until after the sixth day by holding at a mean temperature of $36.3^{\circ} \pm 0.2^{\circ}$ F. The turkey embryos were not injured to the same extent as were the chick embryos under the same conditions. Holding Leghorn eggs for from 21 to 34 days at a mean temperature of $54.2^{\circ} \pm 0.26^{\circ}$ gave a higher hatchability than is usually reported for eggs of this age. Turkey eggs under the same conditions hatched well from the first to the thirty-fourth day. When eggs were held at temperatures near or above the physiological zero (60° to 75°) for prolonged periods or at the rather low temperature of 36.3° , many embryos died during the first few days of incubation.

Blood analyses of normal Bronze turkeys, H. M. SCOTT, P. J. SERFONTEIN, and D. H. SIELING (*Poultry Sci.*, 12 (1933), No. 1, pp. 17-19).—The blood of 10 Bronze pullets and 5 young Bronze toms was analyzed at the Kansas Experiment Station. The detailed results are given in tabular form.

The variations between individuals within a sex were slight. The mean figures were approximately the same for both sexes, with the exception of uric acid and hemoglobin which were higher in the blood of the male turkey. While the analyses were similar for normal turkey blood and normal chicken blood, the following exceptions were noted: The marked difference in uric acid content between sexes was not apparent in chickens, the urea nitrogen content of chicken blood was somewhat lower than that of turkey blood, and the difference in hemoglobin content of the blood of the sexes was very marked in the case of chickens.

Turkey production, F. E. MUSSEHL (*Nebraska Sta. Bul.* 280 (1933), pp. 16, figs. 7).—This is a revision of and supersedes Circular 34 (E.S.R., 56, p. 168).

The National Institute of Poultry Husbandry duck trap nest, V. K. TALLENT and E. W. FOGDEN (*Harper Adams Util. Poultry Jour.*, 18 (1932-33), No. 4, pp. 164, 165, fig. 1).—A trap nest for ducks developed at the National Poultry Institute, England, is described and illustrated in this article.

The rabbit book, F. L. WASHBURN (*Philadelphia and London: J. B. Lippincott Co.*, 1933, 2. ed., rev., pp. 200, figs. 83).—This is a revised edition of the treatise previously noted (E.S.R., 44, p. 369).

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle and dairy products in Idaho] (*Idaho Sta. Bul.* 197 (1933), pp. 33, 34, 35, 54).—The studies with dairy cattle report data on the breeding efficiency of dairy herds, methods of feeding calves, and at the Caldwell Substation a comparison of alfalfa seed screenings with linseed meal for dairy cows, and milking machine tests.

Dairy products studies report information on the standardization of milk for the manufacture of Cheddar cheese, improved methods of making casein, and a butter improvement program.

[Investigations with dairy cattle and dairy products in Wisconsin] (*Wisconsin Sta. Bul.* 425 (1933), pp. 13–15, 23–33, 120, 121, 129–131, figs. 3).—Dairy cattle studies report data on Common Dairy Rations not Deficient in Lime, by E. B. Hart, J. A. Keenan, and G. C. Humphrey (pp. 13, 14); Artificial Drying not Injurious to Nutrients of Alfalfa Hay, by Hart, O. L. Kline, and Humphrey (pp. 14, 15); and Pea Vine Silage Compared with Corn Silage, by G. Bohstedt, B. H. Roche, I. W. Rupel, and J. G. Fuller (pp. 120, 121).

In dairying data are noted on market preferences for color in butter, by H. C. Jackson (pp. 23, 24); Butter Made from Plastic Cream has Certain Shortcomings, by J. C. Linneboe and Jackson (pp. 24, 25); New Types of Butter Wrapping, by L. C. Thomsen (pp. 25, 26); Causes of Soft-Curd Milk, by H. B. Monier, H. H. Sommer, and F. B. Hadley (pp. 26, 27); Whipping Ability of Cream Lowest in Late Spring and Early Fall (p. 27), and factors responsible for quality in cheese spreads (pp. 32, 33), both by H. L. Templeton and Sommer; causes for thickening of sweetened condensed milk, by V. C. Stebnitz and Sommer (pp. 27, 28); improved methods of making cottage cheese, by W. V. Price and M. F. Kelly (pp. 28–30); Causes and Prevention of "Sour" Cheese, by Price, L. W. Brown, and L. Germain (pp. 30–32); Methods of Improving Brick Cheese, by Price and F. E. Hanson (p. 32); and efficient and cheap method of washing milking machines, by E. C. McCulloch and E. G. Hastings (pp. 129–131).

Experiments with dairy cattle, D. V. KOPLAND (*U.S. Dept. Agr., Tech. Bul.* 353 (1933), pp. 40–47, figs. 2).—Information obtained in studies with dairy cattle at the Huntley, Mont., Field Station in cooperation with the Montana Experiment Station is reported for proved sire tests, carrying capacities of pastures, the effect of plane of feeding upon milk production, alfalfa-molasses silage, and feeding cows on alfalfa hay alone.

Roots for the dairy cow, H. O. HENDERSON and K. S. MORROW (*West Virginia Sta. Bul.* 256 (1933), pp. 16, figs. 2).—Continuing this study (*E.S.R.*, 66, p. 568), the results of four feeding tests showed that on a dry matter basis there was little difference in the feeding value of mangels and corn silage for milk production. Cows receiving mangels drank less water from their drinking cups than those receiving silage, but due to the high water content of the roots consumed more total water.

Land that produced an average yield of 10.3 tons of silage per acre yielded on the average 28.7 tons of mangels, 17.1 tons of rutabagas, 15.3 tons of sugar beets, and 10.9 tons of carrots. Under these conditions one acre produced 432.6 lb. of crude protein and 4,944 lb. of dry matter as corn silage, 631.4 and 5,510 lb. as mangels, 581.4 and 3,762 lb. as rutabagas, 367.2 and 6,028 lb. as sugar beets, and 348.8 and 3,357 lb. as carrots.

The cost of producing 100 lb. of dry matter and 100 lb. of crude protein was 57 and 75 percent, respectively, as much with corn silage as with mangels.

[Beet pulp v. molasses for milk production] (*Puerto Rico Dept. Agr. and Com. Sta. Ann. Rpt. 1932, Spanish ed., pp. 40, 41*).—Cost data obtained in a comparison of beet pulp v. molasses in balanced rations are reported.

Grinding grains for dairy cows, J. W. WILBUR (*Indiana Sta. Bul. 372 (1933), pp. 8, figs. 7*).—In order to obtain a better understanding of the value of grinding grains for dairy cattle, four lots of five cows each were fed the same basal ration of corn, oats, wheat bran, and linseed meal. In lot 1 the grains were fed whole, in lot 2 they were coarsely ground, in lot 3 medium ground, and in lot 4 pulverized. In addition all of the animals received alfalfa hay and corn silage.

The results showed that medium finely ground and cracked corn and oats gave satisfactory results in milk production, maintenance of body weight, and economy of production. Whole grains, because of low production, small gains in body weight, and loss of feed in feces, were not economical. Pulverized grain, because the cows could not utilize the nutrients to produce sufficient milk and fat to pay for the cost of grinding, also was not economical. When the production of the cows fed medium-ground grain was used as the basis of comparison, it was found that whole grains, cracked grains, and pulverized grains produced respectively 11.2, 5.8, and 5.4 percent less milk than medium-ground grains.

The value of grinding grains for young dairy calves, J. H. HILTON, J. W. WILBUR, and T. E. HIENTON (*Indiana Sta. Bul. 373 (1933), pp. 4*).—A series of two tests was conducted in which 10 calves were raised to 6 months of age on whole grain and 10 calves on ground grain. The calves were approximately 30 days old at the beginning of the test. They received whole milk for 120 days, and during this period the grain mixture was composed of equal parts of corn and oats. After the milk was discontinued the grain mixture was changed to corn, oats, and soybeans 3:3:1. The fineness modulus for the corn was 3.5219, for the oats 3.2383, and for the soybeans 3.5491. Alfalfa hay was fed throughout the test.

Both lots made good gains in weight and in growth in height at withers. The differences in these growth factors were too small to be significant. The calves on ground grain consumed approximately 0.25 lb. more grain per head daily than those on whole grain.

The apparent and true sugar of the blood of lactating cows fed rations of varying fat content, K. L. TURK and S. H. WORK (*Jour. Dairy Sci., 16 (1933), No. 1, pp. 33-39, fig. 1*).—Using the same six cows that were in a previous study at the New York Cornell Experiment Station (E.S.R., 68, p. 663), data were obtained on the true sugars of the blood. The substitution of part or approximately all of the fat of the grain by an isodynamic amount of starch had no effect upon either the apparent or true sugar in the whole blood or plasma. The mean values for apparent sugar were 51.22 ± 0.26 mg per 100 cc of whole blood and 53.6 ± 0.41 mg per 100 cc of plasma. The mean values for true sugar were 28 ± 0.22 for whole blood and 33.72 ± 0.4 for plasma. There was a correlation coefficient of -0.2399 between apparent blood sugar and milk yield.

Seasonal effect on yield of dairy cows, C. Y. CANNON (*Jour. Dairy Sci., 16 (1933), No. 1, pp. 11-15, figs. 2*).—At the Iowa Experiment Station an analysis was made of the yearly records of approximately 68,000 cows in Iowa cow-testing associations. The results showed that cows freshening in the month of November had the highest average yields. From November to June the group freshening each month produced less than the group freshening the preceding

month, but from June to November the reverse was true. The month of June showed the smallest average milk yield, but the butterfat yield was the same as for the May and July groups. Factors were calculated from these averages, based on mean yield, which could be used in correcting yields for cows started in different months.

Drying up cows and the effect of different methods upon the milk production, R. WAYNE, C. H. ECKLES, and W. E. PETERSON (*Jour. Dairy Sci.*, 16 (1933), No. 1, pp. 69-78, figs. 2).—A comparison was made of three methods of drying off cows at the Minnesota Experiment Station. A total of 18 cows was used, and they were maintained on the same level of feeding during the drying-off period as during the period just preceding. One half of each udder was dried off by one method and the other half by another. All of the milking was done by hand.

Complete cessation of milking proved to be a safe method of drying off cows producing up to 20 lb. of milk per day. Cows could be dried off in less time by this method than by either incomplete milking or by intermittent milking. However, there was no significant difference in the quantity or quality of milk in the lactations following the drying off by any of the three methods.

The authors call attention to the probable desirability of not disturbing the resorption phenomenon by intermittent or partial milking when drying off cows. Complete cessation of milking conserves leucocytes that may have an important function in resorption.

The effect of various methods for drying up cows on the bacterial and cell content of milk, R. WAYNE and H. MACY (*Jour. Dairy Sci.*, 16 (1933), No. 1, pp. 79-91, fig. 1).—Continuing the above study, an investigation was made of the changes in bacterial and cell counts of milk under various conditions of milking and following interruptions of different sorts.

Incomplete, intermittent, incomplete intermittent milking, and complete cessation of milking apparently had no marked effect on the bacterial or cell counts of milk in subsequent lactation periods. The intermittent and incomplete milking usually resulted in somewhat higher bacterial and cell counts during these periods, but there were apparently no permanent effects. Complete cessation of milking gave the most satisfactory results.

Bacterial counts were usually slightly lower during the first few milkings following calving than they were during periods 10 days later. The bacterial counts were slightly higher and the cell counts decidedly higher immediately following periods of suspended milking. Cell counts were usually high during the period when colostrum was being produced, but decreased as lactation advanced. The average bacterial count of 284 samples of normal, aseptically drawn milk was 658, and the average cell count was 1,252,000 per cubic centimeter.

Proportional samples, L. C. BOUGHER (*Milk Plant Mo.*, 22 (1933), No. 5, pp. 32, 33, figs. 2).—In this article a machine is described which will mechanically take samples of milk that are in proportion to the amount of milk sampled and at the same time give samples for a week's run that will come within the desired 2- to 12-oz. range.

Rancid flavors in raw milk, R. J. RAMSEY and P. H. TRACY (*Milk Plant Mo.*, 22 (1933), No. 5, pp. 44, 45, 48).—Studies at the Illinois Experiment Station showed that cowy, rancid, and soapy flavors in raw milk were due to a change in the butterfat and were representative of different stages of the reaction. Oxidation-reduction measurements showed that the development of rancid flavors in raw milk was not due to oxidation. An increase in titratable acidity at the time of these flavor changes indicated a hydrolysis of the butterfat. The

hydrolyzing agent was inactivated by pasteurization but activated by homogenization. An antagonistic reaction was found between the agents of tallowiness and rancidity in raw milk containing copper salts.

Some factors affecting the efficiency of pasteurization of milk, L. R. DOWD (*Amer. Creamery and Poultry Prod. Rev.*, 75 (1933), No. 17, pp. 560, 562, 564, 565, figs. 5).—This study was undertaken to determine the pasteurization efficiency of large numbers of individual milk samples from different sources.

The bacterial count of milk pasteurized in the laboratory never exceeded the count of the same milk when raw. The pasteurization efficiency ratio of milk from individual cows was 105:1. On the other hand, there was a considerable variation in the pasteurization efficiencies of samples from different farms and at different milk plants. A close relationship was found to exist between laboratory and commercial pasteurization if samples of the latter were taken from the vat at the end of the holding period, but there was considerable variation in this relationship in the final container. Atmospheric temperature affected the bacterial count of raw milk, but had little or no effect on the number of organisms surviving laboratory pasteurization. Some relationship was found between the bacterial count of raw milk and of the resulting pasteurized product when large numbers of samples were considered, but this relationship did not exist in individual cases.

The nutritive properties of milk in relation to pasturisation, J. D. STIRLING and J. H. BLACKWOOD (*Hannah Dairy Res. Inst. Bul.* 5 (1933), pp. 80).—In this review an attempt has been made to bring together all the relevant information which is available on the heat treatment of milk in its relation to the general problem of the comparative nutritive values of raw and pasteurized milk. The bacteriological aspects of pasteurization and the problems connected with milk-borne disease are not touched upon.

The influence of agitation of milk before separation on the fat loss in the skim milk, W. FINLAY and J. LYONS (*Roy. Dublin Soc. Econ. Proc.*, 2 (1933), No. 30, pp. 501-513).—At University College, Cork, it was found that the agitation of milk before separation increased the fat losses in the skim milk to a degree that overcame the beneficial effect of preheating. This was particularly true during the summer months. It was evident that while the separation of heated unagitated milk gave the cleanest skimming, it was more economical to separate unheated unagitated milk for the whole year.

The type and degree of agitation influenced the fat losses in the skim milk. Heating milk in a plate pasteurizer under gravity flow gave the best results with little or no agitation losses. Pumping milk through a plate pasteurizer or the effect of the beaters in a flash heater increased losses in the skim milk. The agitation which produced the highest losses gave the highest proportion of fat globules of less than 2μ in diameter and vice versa.

The homogenization of milk and cream, F. J. DOAN and C. H. MINSTER (*Pennsylvania Sta. Bul.* 287 (1933), pp. 20, figs. 3).—Continuing this study (*E.S.R.*, 66, p. 268), it was found that homogenization of milk or cream produced marked changes in their physical and chemical properties. Some of these changes were beneficial for one type of finished product and detrimental for another.

It was shown that the construction of the homogenizing head had a direct influence on the efficiency of the machine. For best results the angle between the valve seat and the wall surrounding the seat should be great, and the distance the fluid is required to travel before striking the wall should be small.

The hydrogen-ion concentration increased in milk or cream not previously heated to a temperature at least as high as 150° F., due to homogenization.

This change was noticeable immediately when the preheating temperature was low, but when a temperature of from 140° to 150° was used it might not become evident until after from 12 to 24 hours. Such milk or cream became rancid, often in a few hours. When milk was preheated at low temperatures, homogenization decreased its surface tension if the fat content was not over 5 to 7 percent. At a higher fat level, homogenization increased the surface tension at first, but it became progressively less on holding. The surface tension of homogenized milk preheated to over 150° was permanently increased. The change in hydrogen-ion concentration and surface tension appeared to be due to a hydrolysis of the fat by lipolytic enzymes producing soluble acids which ionized and were surface tension active.

The greatest amount of fat clumping in homogenized milk containing more than the normal amount of fat occurred when a preheating temperature of 145° and a processing temperature of at least 100° or less was used. When milk was preheated and homogenized at 180° there was no fat clumping, even in milk containing 10 percent fat. The use of a two-stage homogenizer greatly reduced or entirely eliminated fat clumping under all conditions as compared with the single-stage processer. Surface tension results appeared abnormally high when determinations were made on samples showing considerable fat clumping. Such samples had a high viscosity. The two-stage homogenizer reduced the surface tension and increased the alcohol stability of milk as compared with single-stage processing, but the effect was increased as the fat content increased.

Factors affecting the body or viscosity of cream and related matters, J. LYONS and G. T. PYNE (*Roy. Dublin Soc. Econ. Proc.*, 2 (1933), No. 29, pp. 461-500, pl. 1, figs. 6).—In studies at University College, Cork, the viscosity of rich raw cream was found to depend upon the temperature of separation and the previous heat treatment of the milk. For mixed milk the maximum viscosity was obtained at a separating temperature of about 90° F., but when the milk had been chilled previous to separating, a slightly higher temperature was necessary. Milk that had been held at a high temperature gave cream of a low viscosity. Pasteurizing reduced the viscosity of cream, but the flash method of pasteurization had a more detrimental effect on this property of cream than the holding method. With creams of equal fat content, those having the larger fat globules had the lower viscosities, and the effect of pasteurization appeared to be associated with the increase in the size of fat globules. The agglutinin of milk did not appear to contribute to any extent to the viscosity of raw cream.

When chilled pasteurized cream of low fat content was re-separated at 85°, a cream was obtained which was comparable in viscosity to raw cream. However, at certain times of the year this method was unsatisfactory, due to the tendency of the cream to churn during re-separation. Passing a rich, pasteurized cream through a clarifier did not influence its viscosity so much as re-separation.

Homogenizing at low pressures increased the viscosity of creams of high fat content without injury to their whipping or churning properties. An increase in either the pressure or temperature of homogenization of such creams decreased the whipping time and improved the body of the whipped product. Pasteurization had a detrimental and re-separation a favorable influence on whipping time. The whipping time of cream varied inversely with its fat content. The rate of rise in viscosity of rich creams became more pronounced as the fat content increased. For creams containing 50 percent fat there was a reduction of about 3 percent in viscosity value for each 1° increase in temperature.

Viscosity studies of fluid cream, J. H. NAIR and D. E. MOOK (*Jour. Dairy Sci.*, 16 (1933), No. 1, pp. 1-9, figs. 2).—The authors describe a relative vis-

cometer of the gravity type suitable for determining the body of fluid cream in milk plant test rooms. This apparatus has been used to study conditions affecting the viscosity of cream.

It was found that the viscosity of cream was increased by lowering the temperature and by increasing the fat content. This cream was not truly viscous but exhibited thixotropic properties. The body of cream increased with age, the action being rather rapid for a few hours and then decreasing in speed for 48 hours. Agitation reduced the viscosity. Fluid creams of the same fat content from different territories and at different seasons of the year were found to vary considerably in viscosity. A correlation between flow time and variations detectable by the average consumer has been worked out.

Substances adsorbed on the fat globules in cream and their relation to churning.—II, **The isolation and identification of adsorbed substances**, L. S. PALMER and H. F. WIESE (*Jour. Dairy Sci.*, 16 (1933), No. 1, pp. 41-57).—Continuing this study at the Minnesota Experiment Station (E.S.R., 69, p. 263), data are reported on the isolation and identification of the adsorbed material on the surface of milk fat globules in washed cream.

The adsorbed material was composed of a mixture of protein and phospholipids. The protein had the properties of both a hydrophilic and a hydrophobic colloid. In physical properties, percentage of nitrogen, sulfur, and phosphorus, this protein did not correspond with other milk proteins. The major part of the fat globule membrane was made up of this protein. The phospholipids of the membrane were made up of a mixture of monoamino and diamino compounds. The isoelectric point of the membrane material lay at pH 3.9 to 4. Calcium was not intimately associated with the adsorbed material. A large portion of the membrane material was removed during churning. The ultramicroscopic appearance of the aqueous membrane sols was not compatible with the theory that coagulation of the fat membrane material occurs during churning.

Cooling cream at the buying station and keeping it cool while in transit to the creamery, V. C. MANHART, B. E. HORRALL, and T. E. HIENTON (*Indiana Sta. Bul.* 374 (1933), pp. 8).—This study was made to determine the effect on quality of cooling cream by mechanical refrigeration at the buying station and keeping it cool while in transit from the station to the creamery. Samples of cream were divided into seven portions weighing 60 lb. each and were stored under the following conditions: (1) Churned immediately after purchase as a control, (2) held at room temperature for 8 hours and at atmospheric temperature for 16 hours, and churned, (3) held same as above, except held at room temperature for 32 hours, (4) held in a refrigerated storage tank for 8 hours and at atmospheric temperature for 16 hours, (5) the same as above, except that it was held in a storage tank for 32 hours, (6) held in a storage tank for 24 hours and then churned, and (7) the same as above, except that it was held for 48 hours.

The scoring of the butter showed an appreciable depreciation in the quality of cream when it was not cooled either at the station or in transit from the station to creamery. Cooling the cream at the station and not controlling temperature while in transit was of slight advantage in preventing deterioration of quality. Cooling at the station and maintaining the temperature in transit tended to check depreciation in quality during this part of the marketing procedure. On the average it cost 0.47 c. to reduce the temperature of 1 lb. of butterfat in cream 16.6° F. The advisability of cooling cream at the station should depend upon atmospheric temperature during the entire year, the market price differential between grades of butter, the amount and quality of cream at the time of delivery, and the protection given cream against deterioration while

in transit. Cooling at the station prevented mechanical loss due to yeast cream "boiling" over the top of the can. The study showed the necessity of cooling cream at the station and keeping it cool in transit under southern Indiana conditions. However, the method of cooling should depend upon its cost.

Cottage cheese and cultured buttermilk, B. E. GOODALE (*South Carolina Sta. Circ. 49* (1933), pp. 20).—Directions are given for the manufacture of cottage cheese and cultured buttermilk, based on tests conducted by the dairy division and on the best information obtainable from other sources.

The use of corn sugar in the manufacture of sweetened condensed skim-milk, R. J. RAMSEY, P. H. TRACY, and H. A. RUEHE (*Jour. Dairy Sci.*, 16 (1933), No. 1, pp. 17-32).—The Illinois Experiment Station undertook a study to determine the preserving power of dextrose, its properties responsible for the defects incident to its use, the possibilities of changing the methods of processing condensed skim milk so that corn sugar could be used, and the extent to which corn sugar could be substituted for sucrose.

It was found that corn sugar was somewhat more efficient than cane sugar in preserving power. There was no difference in the types of organisms associated with dextrose or sucrose. Corn sugar could be substituted for one half the usual amount of sucrose without danger of crystallization of the dextrose. The tendency of corn sugar to cause physical thickening was probably due to the effect of sugar on the protein, but there was also the possibility that the sugar might react with the mineral salts to change the physical stability of the protein. Forewarming the milk and the sugar separately largely overcame the physical thickening. The brown discoloration of sweetened condensed skim milk was due to sugar protein condensation products rather than to caramelization. Corn sugar should be added in a concentrated solution at the end of the condensing period.

Some of the factors affecting the body and texture of ice cream, B. E. HORRALL (*Indiana Sta. Bul. 375* (1933), pp. 12, figs. 3).—This study was undertaken to determine the effect of different factors on the body and texture of ice cream under commercial conditions.

Ice cream drawn from a freezer at the hard stage had better body and texture than ice cream drawn at either the soft or medium stage. The coarsest body and texture was shown by ice cream drawn at the soft stage. A break test applied to the hardened ice cream gave results similar to the comparative score for body and texture. On the average it required 3 minutes longer to obtain the desired overrun on ice cream drawn at the soft stage than that drawn at the hard stage.

Heat shocking ice cream to simulate conditions in retailing cabinets and in delivery showed that the higher the shocking temperature the coarser was the body and texture after the ice cream had hardened again. Ice cream stored at -10° F. had a better body and texture during a 30-day storage period than ice cream stored at $+10^{\circ}$. Processing the ice cream mix at 165° and 180° produced better ice cream from the standpoint of body and texture than processing at 150° . Fat clumping, viscosity, and time required to obtain the desired overrun were found to decrease as the processing temperature increased. The time of aging a mix between 4 and 24 hours had little effect on body and texture.

Samples of ice cream with high gelatin content that had been homogenized at low pressures were not as coarse and icy as lots with lower gelatin content and higher homogenizing pressure. The smoothness of ice cream increased as the gelatin content increased. It was noticed that in ice cream containing no gelatin and up to and including 0.4 percent of gelatin there was drainage of

water solution not frozen in the freezer to the bottom of the container, making this portion quite icy. This condition did not appear in the samples with higher gelatin content. The basic viscosity increased as the gelatin content of the mix increased, but the lower the gelatin content the shorter was the time required to reach the desired overrun.

Serving temperatures of ice cream, W. H. E. REID (*Ice Cream Rev.*, 16 (1933), No. 10, pp. 37-39).—A study was made at the Missouri Experiment Station to determine whether 6°, 10°, 16°, or 20° F. was the most desirable serving temperature for vanilla ice cream. It was found that the number of cones and the number of pints and quarts that could be dipped from 5 gal. of ice cream increased as the temperature of the ice cream increased from 6° to 20°. The shrinkage per 5-gal. can was 25 percent in the case of ice cream served at 6°, 23.5 percent at 10°, 21.6 percent at 16°, and 16.3 percent at 20°. The ice cream at 6° was firm and resistant, requiring much effort in dishing, which impaired the structure, expelled part of the air, and resulted in low yields. As the ice cream was tempered upward the resistance and excessive firmness decreased. Ice cream tempered to 20° had a body which showed some indication of softness and had a tendency to become sticky or gummy.

In an effort to determine consumer reaction, ten students made a study of the flavor and body of vanilla, chocolate, and strawberry ice cream served at 6°, 10°, 16°, and 20°. The preference expressed was for vanilla and strawberry ice creams served at 16° and for chocolate at 10°. The chief objection to chocolate at 16° was that the flavor was too pronounced. Strawberry ice cream at 20° lacked resistance and was somewhat fluffy. The general criticism for all ice creams at the lower temperatures was that they were too cold and that the desirable flavor was lacking.

VETERINARY MEDICINE

A review of the bacteriology of the normal and infected udder, G. J. HUCKER (*Jour. Bact.*, 25 (1933), No. 1, p. 58).—This is an abstract of a contribution from the New York State Experiment Station, presented at the annual meeting of the Society of American Bacteriologists held in December 1932 and based upon work more detailed accounts of which have been noted (*E.S.R.*, 69, p. 428).

The streptococci found in freshly drawn milk, W. D. FROST and M. A. ENGELBRECHT (*Jour. Bact.*, 25 (1933), No. 1, pp. 58-60).—This is an abstract of a contribution presented at the annual meeting of the Society of American Bacteriologists held in December 1932.

Clinical observations on catarrhal mastitis in the cow, L. A. KLEIN (*Jour. Amer. Vet. Med. Assoc.*, 62 (1922), No. 1, pp. 25-33).—In dealing with the subject in general, the author describes a method of treatment which includes early detection through collection of the flakes or clumps in the foremilk on finely meshed wire strainers placed in a collecting vessel, etc., followed by elimination of the grain ration and of succulent fodder and the administration of Epsom salts, sodium salicylate, etc. Of the 44 cases of catarrhal mastitis treated in this way 81 percent recovered, one half by the fourth day and all but two by the seventh day.

Successful method of treating catarrhal mastitis, L. A. KLEIN (*Penn. Univ., Vet. Ext. Quart.* No. 45 (1932), pp. 4-6).—In this contribution, which supplements the earlier account above noted, the author reports that from 1925 to 1930, inclusive, 2,744 cases have been treated by the method outlined (with but one slight modification), the percentage of cures ranging from 75 to 92.

Agglutination tests in the diagnosis of infectious abortion in cattle (Bang's disease), with special reference to the rapid test, C. R. DONHAM and C. P. FITCH (*Jour. Infect. Diseases*, 53 (1933), No. 1, pp. 98-124, figs. 2).—This contribution from the Minnesota Experiment Station is in continuation of work previously noted (E.S.R., 68, p. 249; 69, p. 585).

It was found that "the sensitivity of *Bact[erium] abortus* agglutination antigen for either the test tube or the rapid test method is increased for most agglutinating serums by the addition of either acacia or gelatin to the antigen. It is not uncommon to encounter agglutinating serums having identical test tube titers that do not respond in the same manner when tested with various kinds of rapid test antigen. The rapid and the test tube method should be standardized each by itself and not one on the other.

"The influence of varying concentrations of electrolytes (as such) in the rapid test method of testing appears to be similar, if not identical, with that in the test tube method. At present, the tests cannot be carried out in the complete absence of electrolytes. Heating rapid test *B. abortus* antigen does not exert any significant influence on its sensitivity. The coagulum formed on the surface of a boiled rapid test suspension of antigen has antigenic properties indistinguishable from the balance of the boiled antigen. There is no evidence to indicate that the removal of the coagulum increases the sensitivity of the antigen.

"Titers can be varied by changing the amounts of the antigen. The size of the drops delivered with dropper pipets as they have been supplied with commercial rapid test antigens varies more than the limits within which variation in the amounts of antigen does not result in consistent differences in the titers. A mathematical analysis of the titers obtained in rapid tests of bovine serums by different observers and with different preparations of antigen shows significant variations in the results. Atypical clumping of rapid test antigen may occur. The activity of specific agglutinin for *B. abortus* is not appreciably influenced by evaporating the agglutinating serum to dryness."

Some observations on the pathology of Johne's disease, E. T. HALLMAN and J. F. WITTER (*Jour. Amer. Vet. Med. Assoc.*, 83 (1933), No. 2, pp. 159-187, figs. 23).—This is a report of a study made at the Michigan Experiment Station of 19 animals from a herd of approximately 150 cattle. Sixteen of these were reactors to the avian tuberculin test for Johne's disease, and the remaining 3 were clinical cases. The ages of the cattle studied ranged from 1½ to 11 years. Five animals had shown clinical symptoms, and 1 was a border-line case.

Grossly recognizable lesions were observed in 17 animals, all of which showed lesions in the small intestine at levels varying from 10 ft. from the abomasum to the cecum. Lesions were found in the cecum of 8 animals, in the colon of 8, and in the rectum of 5. Extensive lesions occurred in only 2 animals, neither of which gave significant clinical evidence of the disease, and but 1 of which showed the classic folding and corrugation of the folds. The typical early intestinal lesion of diagnostic importance, which may be very limited in extent, is described as a small oval or linear, slightly raised, glistening area of a pinkish-gray to reddish or occasionally steel-gray color, located on the crests of the folds. No diagnostic lesions were observed in the lymph nodes, except possibly edema and slight mottling of the cortex.

A technic is given for demonstrating acid-fast rods in tissue stained with carbolfuchsin at room temperature. Histological lesions are limited to the intestinal mucosa, submucosa, and contiguous lymph nodes. All of the 19 animals showed microscopic lesions associated with acid-fast rods. The micro-

scopic lesion consists of one or a few macrophages, one or a few giant cells, or a combination of the two types of cells containing a variable number of acid-fast rods, with no evidence of degeneration of the cells.

Suggestions are advanced to explain the mode of entrance of Johne's bacillus into the tissue, its phenomenal multiplication, and its transportation through the lymphatics. Two cases of extensive affection are described, wherein there are areas of superficial necrosis of the intestinal mucosa containing numerous acid-fast bacilli. The mechanical blocking of the lymph and blood capillaries, due to extreme hyperplasia of the cells of the stroma, is suggested as a hypothetical cause of the necrosis. The theory is advanced that a less extensive superficial necrosis, not conspicuous in gross, could occur intermittently and constitute an adequate explanation of the intermittent diarrhea and the emaciation characteristic of the disease.

In the data presented there is no positive correlation between the extent and number of the lesions and organisms found and the physical condition of the animals.

A list is given of 25 references to the literature.

A paper test for the detection of mastitis, B. E. HORRALL (*Indiana Sta. Bul.* 377 (1933), pp. 8).—In work conducted at the station with a view to finding a simple, accurate, and inexpensive test that could be used by the average dairyman for the detection of the earlier stages of mastitis, the paper test here reported upon was devised. It is made as follows: 0.4 g of dibromothymol sulfonephthalein (bromothymol blue) is dissolved in 25 cc of about 98 percent alcohol and diluted to 100 cc with distilled water. The pH is then adjusted to pH 6.8 by the addition of sodium hydroxide. The paper found to give the clearest color change is Chardin Papier, made in France, which it is stated can be obtained in sheets 50 cm square from laboratory supply houses in this country. It is cut into strips $\frac{5}{16}$ in. wide and the strips pulled through the alcoholic dye in such a way that they are saturated, then hung up to dry. After drying, they are cut into pieces about $\frac{1}{4}$ in. long and placed in a closed container and used when needed.

This test differentiated 94.6 percent of the normal samples from the abnormal samples of milk as shown by the leucocyte count of the milk. It was found to be as accurate as the bromothymol blue test and probably more so in the detection of the earlier stages of mastitis. It is also considered to be a more practical, less expensive, and more convenient test for the detection of mastitis in the udder of the cow. It detected suspicious milk where the bromothymol blue test did not when compared with the leucocyte count of the milk. It showed the same results as the bromothymol blue test on milk from the quarters containing high leucocyte counts and those containing streptococci chains. The paper turned from a yellow to a blue color as the average pH and conductivity of the milk increased, this change of color being gradual.

The leucocyte content of milk as correlated with bacterial count and hydrogen ion concentration for the detection of mastitis, V. A. CHERRINGTON, H. C. HANSEN, and W. V. HALVERSEN (*Jour. Dairy Sci.*, 16 (1933), No. 1, pp. 59-67).—The purpose of this study at the Idaho Experiment Station was to determine the best laboratory method for the diagnosis of mastitis in cows. Aseptically drawn milk from the individual quarters of each udder was used.

Of the laboratory methods tested, the leucocyte content of the milk was the truest indicator of mastitis. Bacterial counts on blood agar were more reliable than those on plain agar for detecting udder infection, because the plain agar often failed to produce distinct colonies of the organisms responsible

for the infection. Changes in hydrogen-ion reaction as determined by the quinhydrone and bromocresol purple methods were so slight, except in extreme cases, that results were difficult to interpret.

The leucocyte count seemed to be the most reliable index because of the large number of leucocytes encountered in milk drawn from infected quarters, their generally high numbers in milk drawn from apparently normal quarters of the same udder, and because the leucocyte content remained constant after it was drawn. An analysis of 758 leucocyte counts appeared to warrant the conclusion that milk from normal udders usually contains less than 50,000 leucocytes per cubic centimeter, while milk from infected udders almost invariably contains more than 100,000 per cubic centimeter.

Bovine nasal schistosomiasis in the Madras Presidency, with a description of the parasite, M. A. NARAYAN RAO (*Indian Jour. Vet. Sci. and Anim. Husb.*, 3 (1933), No. 1, pp. 29-38, pls. 5).—From the histopathology described and the discussion of the schistosomes in the lesions, it was determined that the so-called "nasal granuloma", an account of which has been previously noted by Datta (*E.S.R.*, 68, p. 671), is actually nasal schistosomiasis in cattle. It has been found that an examination of nasal washings for ova is the quickest method of diagnosing these cases. The parasite, which differs from *Schistosoma bovis* and *S. spindalis*, is given the name *S. nasalis* n.sp.

"Circling" disease of sheep in New Zealand, D. A. GILL (*Vet. Jour.*, 87 (1931), No. 2, pp. 60-74, figs. 11).—In this contribution the author describes and gives the details of cases of meningo-encephalitis observed in sheep in New Zealand. The bacteriological findings in the cases investigated are reported upon and the possible channels of entry considered.

Circling disease, a meningo-encephalitis of sheep in New Zealand: Notes on a new species of pathogenic organism, D. A. GILL (*Vet. Jour.*, 89 (1933), No. 6, pp. 258-270, pls. 2).—This is a report on further work on the disease of sheep in New Zealand above noted, in which a new pathogenic organism was found in association with the brain lesions and is here described as the "X" organism. "It is pathogenic for rabbits as well as sheep, and appears to have a predilection for the meninges and nerve tissue. Sheep have developed a pneumonia and meningitis as a result of drenching with broth cultures of the organism via the nostrils. Some success has attended the efforts made to set up lesions in the brain that are similar to those seen in natural cases. This has been accomplished by inoculation, after over a year's subculturing, into the carotid artery of sheep. The nature of the lesions in natural cases suggested that the organism may be functioning in combination with, or secondarily to, a neurotropic virus. This is discussed, and some facts that have been gathered about the epidemiology of the disease are included. The organism described does not appear to fit into any recognized genus, and a definite name for it cannot therefore be suggested in the meantime."

Field investigations relative to control of *Oestrus ovis*, W. C. MITCHELL and N. G. COBBETT (*Jour. Amer. Vet. Med. Assoc.*, 83 (1933), No. 2, pp. 247-254, figs. 2).—The authors have found the sheep botfly to be prevalent throughout western Texas and eastern New Mexico, with indications that from 87 to 97 percent of the sheep are infested.

"The infestation of individual sheep varied from 1 to 40 larvae, all stages of larval development often being observed in one head. Minute first-stage larvae, in the majority of cases, appear to migrate from the nasal passages to the frontal sinuses for further development. Infestation of the maxillary sinuses seldom was observed. No evidence was found to show that *O. ovis*, in Texas and New Mexico and in such infestations as were observed, is a lethal

factor in causing the death of sheep in large numbers, but it is a factor in causing excessive nasal discharge with accompanying detrimental effects.

"Pathological changes in the tissues affected by *O. ovis* larvae were observed only in cases where grubs had died within the head cavities. In view of the fact that dead larvae which become lodged in the cavities of the head, especially the frontal sinus, produce pathological conditions, we raise the question as to the value of treatments intended to kill these grubs in this location. Methods of control or eradication of *O. ovis* apparently should stress preventive measures rather than the destruction of larvae within the head cavities.

"Our observations are in agreement with those previously reported to the effect that the activity of the sheep gadfly interferes with the proper feeding and management of sheep. A thorough application of commercial pine tar to the noses of sheep at intervals of twice a week to once in two weeks has very little repellent effect on the adult fly. The results obtained in experiments with the salt-trough method of applying repellent to the noses of sheep show some promise of usefulness. A new type of applicator for tarring the noses of sheep was developed and is described here."

A strain of *Clostridium welchii* producing fatal dysentery in lambs, E. A. TUNNICLIFF (*Jour. Infect. Diseases*, 52 (1933), No. 3, pp. 407-412).—Contributing from the Montana Experiment Station, the author reports that "in an outbreak of lamb dysentery caused by *C. welchii* the course was peracute in that early prostration accompanied the diarrhea or in some cases appeared before the diarrhea developed. The bacterial flora contained the same group of micro-organisms found in normal lambs and in 11 other outbreaks of dysentery, but the strain of *C. welchii* recovered in this case differed in its high toxicity from strains previously studied. It belongs to type 2, forms acrolein, and possesses slight liquefying properties for coagulated horse serum. This is not the same organism which Dalling described in England as the lamb dysentery bacillus [E.S.R., 60, p. 272; 67, p. 73]. This peracute type of dysentery is regarded as an unusual form of lamb diarrhea in Montana."

Sanitation as a method of controlling stomach worms in lambs, E. H. HOSTETLER and J. E. FOSTER (*North Carolina Sta. Bul.* 287 (1933), pp. 16, fig. 1).—In the experimental work here reported, the details of which are given in tabular form, it was found that if lambs are permitted to graze on permanent pasture in the Piedmont that is infested with stomach worms (*Haemonchus contortus*) throughout the growing season a large percentage die if they are not drenched regularly. Lambs grazed on temporary pastures and not drenched gained more rapidly than similar lambs that were drenched and grazed on permanent pasture. The lambs grazed on temporary pasture also were in noticeably better condition and more vigorous at the close of the drenching season. Ewes that had access to winter grazing, Abruzzi rye, and crimson clover maintained their weight during the lambing and nursing periods, while those kept on permanent pasture or in dry lots showed a slight loss in weight. The length of time required to reach market weight was less for lambs grazed on temporary pastures than for those grazed on permanent pasture. Single lambs made more rapid gains and reached market weight at an earlier age than twin lambs.

Gains and post-mortem examinations showed that it was unnecessary to drench lambs that were grazed on permanent pasture before June 1. However, from this date until November 1 regular periodic drenching was not only necessary but imperative. Drenching without fasting produced more rapid gains than with fasting, but the post-mortem results showed a slightly greater infestation in the unfasted group. Temporary pastures were equivalent to

drenching at 14-day intervals on permanent pasture in the control of stomach worms. Nodular worms are not noticeably affected by drenching with nicotine sulfate but are checked somewhat by the use of temporary pastures. Sanitary quarters and fields used for temporary pastures will gradually become infested with stomach and nodular worms over a period of years if used continuously by sheep.

It is considered probable that the changing of pastures as often as possible, supplemented by drenching whenever conditions show this to be necessary, is the most practical method of stomach worm control. Systematic use of temporary pastures is considered a feasible method of decreasing stomach worm and other internal parasite infestation in sheep to such an extent that these parasites do not interfere with the normal growth and gains of the lambs.

Transmission of Aujeszky's disease to the young pig [trans. title], P. REMLINGER and J. BAILLY (*Bul. Acad. Vét. France*, 6 (1933), No. 4, pp. 169-179; *abs. in Compt. Rend. Soc. Biol. [Paris]*, 113 (1933), No. 17, pp. 36, 37).—Experiments with young pigs in which a virus from Hungary, from which country the disease was first described by Aujeszky in 1902 (*E.S.R.*, 14, p. 707), and one from Brazil, where it was first reported by Carini and Maciel in 1912 (*E.S.R.*, 28, p. 184), were ingested with the viscera and the brains of infected laboratory animals have shown that the affection known as Aujeszky's disease, infectious bulbar paralysis, or pseudorabies may be contracted by the pig in this way. Reference is made to its occurrence in Iowa, as first reported under the name "mad itch" by Shope in 1930 (*E.S.R.*, 69, p. 266), and in the Netherlands, as reported by Burggraaf and Lourens in 1932 (*E.S.R.*, 68, p. 527).

It is concluded that the virulence of the blood does not occur in all species with the same constance as in the rabbit; when it occurs in the blood of swine it is associated with the blood cells, the serum being devoid of its presence. The authors' studies have led them to doubt if the virus is transmitted in a therapeutic serum, such as anti-hog-cholera serum, a view advanced by Burggraaf and Lourens.

In a discussion which follows (pp. 178, 179), J. Lignièrès emphasizes the importance of the authors' demonstration of its transmission by ingestion, indicating possible spread through a contaminated water supply. He calls attention to the fact that for many years this disease has been met with in cattle in some localities in northern Argentina, where it is known as mal de caderas. It is also known by this name in Paraguay, and under it has been reported upon by Migone and Peña and by Urízar (*E.S.R.*, 68, p. 250).

Mention is made of work by S. S. Quiroga et al. in Argentina, reported in December 1932, which has resulted in the preparation of a protective vaccine administered subcutaneously. This vaccine, consisting of an emulsion of brain tissue of affected animals treated with chloroform, has given good results, more than 23,000 head having been thus protected.

Neuritis in swine associated with atypical posterior paralysis, L. P. DOYLE (*Jour. Amer. Vet. Med. Assoc.*, 83 (1933), No. 2, pp. 261-263, fig. 1).—This contribution from the Indiana Experiment Station reports upon some 20 animals in a herd of 300 shoters, 4 to 6 months of age, in which atypical paralysis and weakness of the hind limbs were observed. The disease occurred during the summer months while the shoters were on pasture, mainly bluegrass, and were being fed a ration of corn and tankage.

Schistosoma indicum Montgomery 1906 as the cause of a persistent debility in equines in India, with a description of the lesions, S. C. A. DATTA (*Indian Jour. Vet. Sci. and Anim. Husb.*, 3 (1933), No. 1, pp. 1-28, pls. 6).—After an introduction and reports of eight cases, the morbid anatomy

of the affection is dealt with at length, followed by a discussion of diagnosis and of methods of control. A list of 52 references to the literature is included.

The curative treatment of surra (*Trypanosoma evansi* infection) in equines by means of "Bayer 205" (Naganol), S. K. SEN (*Indian Jour. Vet. Sci. and Anim. Husb.*, 3 (1933), No. 1, pp. 85-102).—The author has found that while the intravenous-intrathecal method of administration of Bayer 205 is a definite advance in the treatment of equine surra, being well calculated to prevent the occurrence of relapses, the method represents, in reality, an extension rather than a supersedence of the simple intravenous form of treatment. The combined method is indicated only in actual cases of cerebrospinal involvement, as determined by the presence of parasites in the spinal fluid, or when outwardly visible symptoms of typical surra are quite manifest; in other cases, complete cure can often be obtained by administering the intravenous injection of the treatment alone, but successful treatment in such event is achieved in very early cases of infection, as pointed out by Edwards (E.S.R., 59, p. 673).

The main problem that requires elucidation at the present time is said to relate not to the genesis of relapse strains, but to whether Bayer 205 does not possess the requisite degree of penetrability to be capable of finding its way into the spinal canal even when the drug is introduced intravenously alone into the general circulation.

It is pointed out that Edwards "has already obtained results pointing to the conclusion that Bayer 205 is endowed with such properties (ante), whilst the experience of later workers has also shown that in the treatment of clinical cases of equine surra a single intravenous injection of Bayer 205, at the rate of 5 to 8 g per 1,000 lb. body weight, is usually capable of effecting a cure under field conditions in India, and in a great majority of such 'cured' cases no relapse has been found to occur during a post-treatment observation period extending over a year or more. If these findings are confirmed by future experience, then the problem of controlling surra will have been solved in a manner consistent with the requirements of field workers in India, for in that event the treatment will involve neither the technicalities of the intrathecal puncture nor the multiplicity of injections entailed by the combined method."

On the disinfection of avian fecal material, W. L. MALLMANN and W. L. CHANDLER (*Jour. Amer. Vet. Med. Assoc.*, 83 (1933), No. 2, pp. 190-196).—In work at the Michigan Experiment Station, "colloidal iodine (Chandler) was found to sterilize avian fecal material when used in a 0.2 percent solution at the rate of 200 parts to 1 part of fecal matter. Under similar conditions, 1:500 mercuric chloride, tincture of iodine (full strength), chlorinated lime (1 lb. to 4 gal. of water), 10 percent formalin, 10 percent lye, and a 1 percent solution of creolin failed. The failure of these compounds to sterilize a small amount of finely divided avian fecal matter was due to their inability to penetrate solid particles of organic matter."

Experiments on fowl-pox, C. L. MARTIN (*Jour. Amer. Vet. Med. Assoc.*, 83 (1933), No. 2, pp. 188, 189).—Vaccination work with fowl pox conducted in New Hampshire since 1926 has shown the stick method to produce as favorable results as the follicle method and to be possessed of additional advantages, including (1) vaccination at least three times as fast, (2) about one third the amount of vaccine required, (3) less severe vaccination reaction, and (4) the number of head lesions substantially reduced.

A plan for the eradication and control of infectious laryngotracheitis, C. S. GIBBS (*Poultry Sci.*, 11 (1932), No. 6, pp. 360, 361).—The author reports

upon a plan for the eradication and control of infectious laryngotracheitis, based upon studies at the Massachusetts Experiment Station (E.S.R., 68, p. 534; 69, p. 424), the procedure in which is as follows: "All of the old birds should be disposed of before or at the end of the hatching season. The young chicks should be kept entirely separate from the old birds and the premises. All buildings occupied by the old birds should be thoroughly cleaned and disinfected as soon after disposition as possible. Permitted disinfectants should be used as directed for disinfecting the houses and equipment. The houses and yards, after cleaning and disinfecting, should be opened to the air and sunshine and left vacant for two months or longer. The reintroduction of infectious laryngotracheitis should be guarded against."

The Massachusetts plan for the eradication and control of infectious laryngotracheitis, C. S. GIBBS (*Jour. Amer. Vet. Med. Assoc.*, 83 (1933), No. 2, pp. 214-217).—This contribution from the Massachusetts Experiment Station presents a plan for the eradication and control of infectious laryngotracheitis as above noted.

The immunology of infectious laryngotracheitis, C. S. GIBBS (*Massachusetts Sta. Bul.* 295 (1933), pp. 20, fig. 1).—In the study here reported, conducted with a view to obtaining a cheap, easily administered, and fairly effective method of immunization, the author has found the inoculation of the bursa of Fabricius to be the most satisfactory method of immunizing birds against this disease.

"The best time to vaccinate appeared to be between 3 and 4 months of age, or when the bursa of Fabricius had reached its greatest development. Only birds in the best of health are suitable for vaccination against infectious laryngotracheitis. The significance of certain traumatic cysts, blow-outs, and adhesions found in the bursa of Fabricius and adjacent parts of some of the birds after vaccination is not understood, in view of the fact that special care was taken to avoid rough handling. Special care should be exercised in selecting and cultivating tracheal exudate for bursa of Fabricius vaccination in order to exclude pathogenic bacteria and viruses other than the causative agent in infectious laryngotracheitis. Infectious laryngotracheitis tracheal exudates desiccated and preserved by the modified Swift method maintain their virulence for several months. Final judgment should be withheld on the bursa of Fabricius vaccination until carefully controlled experiments are completed to determine its practical value under range conditions and the duration of immunity in fowls in heavy production."

A list is given of 23 references to the literature.

Hereditary resistance to pullorum disease, E. ROBERTS and L. E. CARB (*Poultry Sci.*, 11 (1932), No. 6, pp. 373, 374).—Reporting upon the progress of work under way at the Illinois Experiment Station (E.S.R., 68, p. 666), it is pointed out that more than 28,000 birds have been used. Average results for the seven years have shown a survival in the resistant strain of 65.3 percent of the chicks exposed to the disease by inoculation at 24 hours after hatching. The corresponding figure for survival among unselected stock is said to be 27.5 percent. When crosses were made between the resistant and unselected stocks, the resulting chicks proved to be almost as resistant as those of the selected strain.

"Corroborative evidence has been obtained from a study of oriental fowls. In North China a breed was found in which pullorum disease was present. In Central China there was found another breed in which the disease was not present insofar as could be determined. The average of two years' tests gave a survival of 50.3 percent for the former and 12.4 percent for the latter. If

resistance and susceptibility are hereditary, or in part due to hereditary factors, natural selection would tend to eliminate the susceptible individuals and produce a population more resistant than a population which had not been subjected to such natural selection."

A possible new respiratory disease of chickens, W. J. PISTOR, H. A. HOFFMAN, and J. R. BEACH (*Calif. Cult.*, 80 (1933), No. 17, p. 357).—A disease involving the respiratory system, sinuses of the head, and the eyes that resembles infectious laryngotracheitis in some respects but with some marked differences, which appeared in a flock of 1,100 5-month-old pullets in Sonoma County, Calif., in March and in two other flocks in April, is described.

Cecal occlusion in the prevention of blackhead (enterohepatitis) in turkeys, C. F. SCHLOTTHAUER, H. E. ESSEX, and F. C. MANN (*Jour. Amer. Vet. Med. Assoc.*, 83 (1933), No. 2, pp. 218-228, figs. 6).—This work, which supplements and confirms the studies of Durant previously noted (*E.S.R.*, 63, p. 376), is considered to have shown definitely that a turkey with occluded ceca may die of blackhead, but that a high percentage of birds operated on will survive in an environment in which all normal birds will succumb to the disease. It is again shown that the ceca of the turkey can be occluded in a satisfactory and practical manner, and that occlusion of the ceca does protect against the infection of blackhead.

Cecal abligation of turkeys by the use of clamps in preventing enterohepatitis (blackhead) infection, J. P. DELAPLANE and H. O. STUART (*Jour. Amer. Vet. Med. Assoc.*, 83 (1933), No. 2, pp. 238-246, figs. 3).—This contribution from the Rhode Island Experiment Station supplements the work of Durant on the cecal abligation of turkeys (*E.S.R.*, 63, p. 376).

Mortality from cecal abligation by clamping resulted in an average mortality of 14.7 percent for all turkeys operated on, with the exception of the fifth of six groups. The mortality from the operation was less in the birds operated on at 6 and 7 weeks of age than in those operated on at 3 weeks of age. Five out of 64 operated on at 6 and 7 weeks of age died as a result of the operation, a mortality of 7.8 percent. Seventeen out of 85 operated on at 3 weeks of age died as a result of the operation, a 20 percent mortality.

Fifteen (68.2 percent) of the control turkeys of the first, second, and third groups, under extreme exposure to enterohepatitis infection, contracted the disease and died, with an average exposure period of $4\frac{1}{3}$ weeks. Three (4.4 percent) of the operated birds contracted the infection and died, with an average exposure period of approximately 5 months. None died from enterohepatitis in less than 5 months following the operation. Three (5.1 percent) of the operated birds of the fourth and sixth groups contracted blackhead, as against 20 percent for the nonoperated birds on range with them. Twenty of the 23 birds operated on at 6 weeks of age (fifth group) and suffering from coccidiosis died following the operation, thus showing the operation to be hazardous when this infection is present.

Five of the 6 operated birds dying from enterohepatitis showed one or both ceca to have resumed functioning. This was not observed to have occurred in less than 4 months following the operation. The examination of 27 birds autopsied showed 66.7 percent of those observed 4 to 6 months after the operation with one or both ceca functioning. As one or both ceca have been found to resume functioning approximately 4 months following the operation, the practical value of the use of this operation becomes somewhat questionable. A possible explanation as to the cause of the ceca refunctioning is offered, being that bacterial action in and around the embedded clamps probably results in a fistulous opening which becomes increased in size due to the passage of material in and out of the ceca.

The operation was effective in preventing blackhead for a period of 4 months, as none of the birds operated on contracted the infection in less than this period of time, even when exposed to severe infection.

The average mortality as a result of the use of this technic is considerably lower than that reported by Durant using a similar technic.

Distribution of *Tetrameres americana* in New Jersey, F. R. BEAUDETTE, J. J. BLACK, and C. B. HUDSON (*Jour. Parasitol.*, 19 (1933), No. 4, pp. 302, 303).—This contribution from the New Jersey Experiment Stations, after referring briefly to the observations of *T. americana* by Cram¹ (*E.S.R.*, 6b, p. 181), reports upon its occurrence in New Jersey. What appeared to be *T. americana* was encountered by the authors September 25, 1931, in 1 of 2 turkeys that came from an original flock of 140 at Allentown, N.J., which at the time of examination had been reduced by losses to 95. Both of the birds examined showed typical blackhead lesions of the liver and ceca, and in addition 1 showed a single female *T. americana* parasite in the proventriculus. The turkeys were running with chickens which would serve as a source of infection for both blackhead and the parasite in question.

"In the examination of 6,042 chickens (of 2 weeks of age or older), 81 turkeys and 22 quail between January 1, 1930, and December 31, 1931, 86 birds were found to be infested with *T. americana*. In addition to the single infestation in 81 turkeys, 1 infested quail was found in the 22 examined. The remaining 84 infested birds were distributed as follows: 4 in 2,389 birds (both sexes) from 2 weeks to 3 months old; 68 in 3,028 pullets (3 months to 1 year old); 3 in 108 cockerels (3 months to 1 year old); 8 in 497 hens and 1 in 20 cock birds."

Examinations made of fowls in various counties in the State, conducted with a view to determining the distribution and the percentage of infestation, are reported upon. No infestation was found in four southern counties; neither did examinations of 279 birds originating in seven neighboring States show any infestation.

Relapse and associated phenomena in the *Haemoproteus* infection of the pigeon, G. R. COATNEY (*Amer. Jour. Hyg.*, 18 (1933), No. 1, pp. 133-160, figs. 7).—The author considers the experience with the one bird studied to indicate that heavy infections with this parasite may be pathogenic.

An outbreak of quail disease in bob-white quail, E. M. PICKENS, H. M. DEVOLT, and J. E. SHILLINGER (*Md. Conserv.*, 9 (1932), No. 2, pp. 18, 19).—A report of the findings obtained in a study of a disease affecting quail at the Gwynnbrook State Game Farm, commenced in January 1932. "The majority of early cases showed plump carcasses with congestion of certain internal organs and a few intestinal ulcers appearing as the principal lesions. Later in the course of the outbreak, the carcasses were thought to be less plump and discoloration of the liver often accompanied numerous ulcers of the intestine. It seems entirely possible, therefore, that pneumonia may have been more prevalent in the early cases."

Bacteriological examinations did not yield uniform results. The organism most frequently obtained in this way was the colon bacillus, which inhabits the intestine and sometimes makes its way to other parts of the body and may produce disease. In addition, a few cultures of bacteria classified as a "paratyphoid" were obtained. "It was found that an extract made in physiological salt solution from the organs of quail that had died with the disease would kill guinea pigs within a few hours after injection into the body cavity. Cultures taken from organs of such pigs yielded results in a high percentage

¹ *Jour. Parasitol.*, 18 (1931), No. 1, p. 48.

of the cases. The 'colon organism' was usually recovered in this way, but in a few cases cultures developed the 'paratyphoid organism.' Extracts from quail organs were passed through very fine filters to remove the bacteria. Injections of this material into guinea pigs were made without harmful effects. While these tests are not considered conclusive evidence, they indicate that this disease is not caused by a filtrable virus. It was found possible to carry these pathogenic organisms from the liver of a deceased quail through 15 successive guinea pigs."

The findings in the present investigation might suggest the combination of lowered resistance on the part of the birds and the colon, paratyphoid, or other organisms as the causative agents. Coccidia were not found. It is concluded that the outbreak is due to a disease which has frequently been designated as "quail disease."

A text-book of pathology, W. G. MACCALLUM (*Philadelphia and London: W. B. Saunders Co., 1932, 5. ed., rev., pp. [2]+XVI+1212, figs. 652*).—A thoroughly revised edition of the work previously noted (E.S.R., 61, p. 567).

[Work with animal diseases at the Idaho Station] (*Idaho Sta. Bul. 197 (1933), pp. 29-31, 32, 33, 34*).—The work of the year referred to includes that with pullorum disease and intestinal parasites in poultry, udder infections and mastitis, eradication of infectious abortion, foul sheath infection of rams, and the sheep botfly.

[Work with animal diseases at the Wisconsin Station] (*Wisconsin Sta. Bul. 425 (1933), pp. 21, 22, 122-128*).—The work of the year referred to includes that with pullorum disease, by J. G. Halpin, C. E. Holmes, B. A. Beach, and C. R. Strange (pp. 21, 22); infectious abortion, by Beach et al. (pp. 122-125); streptococci responsible for certain breeding diseases of cattle, by Beach, E. G. Hastings, G. C. Humphrey, and E. C. McCulloch (pp. 125, 126); mastitis caused by several different micro-organisms, by F. B. Hadley et al. (pp. 126, 127) (E.S.R., 69, pp. 274, 586); and "no-lesion" reactors, by Hastings, J. McCarter, and Beach (pp. 127, 128) (E.S.R., 69, p. 275).

The bursate lungworms of domesticated animals, T. W. M. CAMERON (*St. Albans, Eng.; Imp. Bur. Agr. Parasitol., 1933, pp. 36*).—This contribution is presented in connection with an eight-page list of references to the literature.

The in vitro cultivation of filterable viruses, G. H. EAGLES (*Biol. Rev. and Biol. Proc. Cambridge Phil. Soc., 8 (1933), No. 3, pp. 335-344*).—Following an introduction, this contribution deals with the nature of filtrable viruses, the cultivation of vaccinia virus, other viruses which have been cultivated by in vitro methods, and the rationale of virus culture.

"The two generally held theories of the nature of the filtrable viruses affecting animals are outlined. The living, particulate nature of these is discussed in the light of present research and their almost certain affinities with the known bacteria. The weight of evidence is almost wholly in favor of this view. The importance of cultivation as evidence in favor of the living nature of the viruses is pointed out and the cultivation of vaccinia virus discussed in some detail. A short survey of the cultivation of some other viruses is given mainly to show that the methods successful in vaccinia have proved successful with other viruses.

"The requirements of filtrable viruses for successful culture are discussed insofar as knowledge at present permits. The bulk of opinion is in favor of an intimate relation between living susceptible cells and the elementary bodies which constitute the virus. The possibility of culture in the absence of cells is dealt with and the evidence on this point outlined. The significance of the

interrelation of elementary bodies, virus inclusion bodies, and cultivation is indicated."

A list of 50 references to the literature is included.

The use of reduced iron for the cultivation of anaerobic organisms, J. P. SCOTT and C. A. BRANDLY (*Jour. Bact.*, 26 (1933), No. 1, pp. 1-7).—Contributing from the Kansas Experiment Station, the authors report having found the use of reduced iron to provide "a simple method of growing anaerobic organisms in semisolid or liquid media without the use of other special anaerobic methods. The use of reduced iron in carbohydrate salts medium gave the typical fermentation reactions with all the anaerobes tested. Reduced iron produced an active reduction of methylene blue as contrasted to the passive inhibition of oxidation produced by a vaseline seal. *Clostridium sporogenes* produced indole in peptone water containing reduced iron. *C. tertius* and *C. tetani* were methyl-red positive in Clark and Lubs' medium without iron and in Clark and Lubs' medium containing 200 mg iron, but methyl-red negative in this medium containing 1,000 mg iron."

Anaplasmosis, VI, G. DIKMANS (*Jour. Amer. Vet. Med. Assoc.*, 83 (1933), No. 2, pp. 203-213, figs. 4).—This concluding contribution (E.S.R., 69, p. 711) deals with the morphology of *Anaplasma*. The conclusions drawn from the series and a review of the literature, to which 39 references are given, are as follows:

"A disease of cattle in Louisiana, characterized by fever, severe anemia, icterus, profound depression and disturbance of digestive functions as clinical symptoms, and by the appearance of 'marginal points' in the blood smear, has been proved experimentally to be identical with the disease anaplasmosis reported from other parts of the world. This disease occurs in a pure form, i.e., unassociated with piroplasmosis, and in the absence of the tick *Boophilus annulatus*, which is the recognized carrier of piroplasmosis in the United States.

"This disease, occurring in a pure form in Louisiana, is identical with the disease occurring in Texas in association with piroplasmosis. The disease is inoculable from animal to animal by blood inoculation. An animal once recovered from the disease is relatively immune to a second inoculation [but] remains a carrier for at least three years. The blood of a bovine suffering from anaplasmosis can be injected into a sheep without producing any visible effect. The blood withdrawn from such a sheep, 30 days after inoculation, and injected into a susceptible bovine does produce anaplasmosis. The disease cannot be transmitted to either rabbits or guinea pigs by blood inoculation even after these animals have been splenectomized.

"*B. annulatus* engorged on anaplasmosis carriers can transmit the disease to susceptible animals in the next generation. The larvae or seed ticks of *Amblyomma americanum*, the progeny of adults engorged on animals suffering from anaplasmosis, did not transmit the disease in the next generation. The etiological agent of anaplasmosis is not a filtrable virus as judged by the filtration methods thus far employed. *A. marginale*, while commonly found as definitely rounded, deeply staining granules, does exhibit other forms and these forms must be considered when these 'points' are studied from the viewpoint of morphology. *A. marginale* appears to show dividing forms when it is cultured in defibrinated or citrated blood to which a small amount of glucose has been added."

The occurrence of *Anaplasma marginale* Theiler 1910 in northern Queensland, J. LEGG (*Aust. Council Sci. and Indus. Res. Pam.* 38 (1933), pp. 31, figs. 4).—A preliminary survey of the piroplasmic diseases affecting

bovines has shown *Piroplasma bigeminum*, *Theileria mutans*, and *A. marginale* to occur in the tick-infested areas of northern Queensland. *A. mutans* has not been previously recorded from Australia. Observations indicate that a blood parasite of the *Babesiella* type occurs in northern Australia.

Of the four strains of *A. marginale* tested, it was found that all were capable of producing a severe reaction in cattle. The recovered animals are undoubtedly now highly resistant to the disease and could withstand natural infection without undue risk. The initial reaction from blood inoculation, however, was too severe to indicate that these strains could be used for the purpose of premunizing cattle.

A list is given of 18 references to the literature.

The foci of the virus in experimental Aujeszky's disease [trans. title], P. REMLINGER and J. BAILLY (*Compt. Rend. Soc. Biol. [Paris]*, 113 (1933), No. 18, pp. 125, 126).—In experimental work with the rabbit it was found that the virus of Aujeszky's disease passes from the point of inoculation, in which tissue or organ it multiplies, to the central nervous system in the blood and lymph and not by way of the peripheral nerves. The disease was reproduced from pulp of the liver, spleen, kidneys, testis, suprarenal capsules, bone marrow, etc. It was not detected in the saliva, urine, or feces.

Dissociation in the genus *Brucella*, B. S. HENRY (*Jour. Infect. Diseases*, 52 (1933), No. 3, pp. 374-402, figs. 2).—In the author's studies "five types of colonies in cultures of *B. abortus* are designated as S, I, R, RB, and S^R. These variants are common in old stock cultures. The R type was not observed in primary isolations. Most, if not all, strains of *B. abortus* are capable of producing variants of the R type in broth cultures. Immune serum broth exerts little influence on the rate or on the extent of dissociation. Reversion of the R type to a pseudo S form occurs. Continued selection of single colonies does not tend toward stabilization of the type. Biochemical tests have failed to reveal significant differences in the reactions of the variants.

"The R forms of several strains of *B. abortus* have proved relatively nonvirulent for rabbits, guinea pigs, and cattle. Serologic tests indicate that, except for a small amount of S antigen which may be present, the R and the S^R forms are feebly agglutinogenic. By the injection of abortin, cutaneous hypersensitivity has been demonstrated in guinea pigs inoculated with the S^R type of *B. abortus*, but not in those inoculated with the R type. No R forms were detected in the milk of a large number of cows. The condition of carrier of the R type has been produced in one cow by the subcutaneous injection of this form. Infection, on subsequent inoculation with a virulent strain of *B. abortus*, was not prevented by the condition of the carrier of the R type."

Differentiation of bovine and porcine strains of *Brucella abortus* based on dissociation, B. S. HENRY (*Jour. Infect. Diseases*, 52 (1933), No. 3, pp. 403-406, figs. 2).—The author here describes a method employed in the differentiation of strains of *B. abortus* of bovine from those of porcine origin, based on the size relations of the R and S colonies in the two strains as worked out in California. It was found that in the porcine strains the R colonies are smaller than the S colonies, whereas the reverse is true in the bovine strains.

The toxicity of *Drymaria pachyphylla* for cattle, sheep, and goats, F. P. MATHEWS (*Jour. Amer. Vet. Med. Assoc.*, 83 (1933), No. 2, pp. 255-260, fig. 1).—This is a contribution from the Texas Experiment Station reporting upon work conducted at the loco weed laboratory at Alpine, where some important losses occurring in cattle on the ranges in southwestern Reeves County near Balmorhea were found to be due to eating *D. pachyphylla*. The losses thus caused appear to occur only during periods of unfavorable range conditions.

The plant caused death in a sheep when fed at the rate of 0.6 percent of the body weight, and in a cow when 0.4 percent of the body weight was fed. The goat seems much more resistant, as it required 0.97 percent of the body weight to cause death. The symptoms and pathology were found to be of but little assistance in arriving at a diagnosis.

Neoplasms encountered in federally inspected establishments in Denver, Colorado, C. L. DAVIS, R. B. LEEPER, and J. E. SHELTON (*Jour. Amer. Vet. Med. Assoc.*, 83 (1933), No. 2, pp. 229-237).—The findings, the details of which are presented in tabular form, show that food-producing animals are susceptible to all types of neoplasms, carcinomas predominating in cattle and sheep, and carcinoma of the eye being the most common external tumor in cattle. The adrenal gland in cattle and sheep shows a greater tendency to cancerous involvement than other internal organs. Hogs seem to be less susceptible to carcinomatous growths. The kidney in hogs is the common seat of neoplastic proliferation.

Serum-proteins of healthy hill bulls and their variations during rinderpest and after recovery, K. C. SEN and A. C. ROY (*Indian Jour. Vet. Sci. and Anim. Husb.*, 3 (1933), No. 1, pp. 39-64, pls. 8).—An analysis of different serum protein fractions of 28 healthy bulls was made by a modification of Wu's colorimetric procedure, and the standard data for total protein, albumin, globulin, euglobulin, and pseudoglobulin for these animals were tabulated. The preexisting ratios between different protein fractions were calculated, and it was shown that these ratios do not give any indication of the immunological behavior of the animals toward a rinderpest infection.

"An experimental study has been made of the variations of different serum protein fractions during an attack of rinderpest. It has been found that in every case when the disease ended fatally there was a decrease in the absolute amount of the total protein, globulin, and euglobulin, thus confirming the results . . . previously obtained in this laboratory. When the results were, however, expressed in percentage of the total protein, a daily analysis showed considerable fluctuations in the values of these different fractions, and a clear-cut generalization could not be made. There was a fluctuation of the different protein fractions for a long period after recovery of the two animals which survived an attack of the disease. A consideration of the different factors involved in this behavior points to the view that this phenomenon may be due to either a seasonal or environmental effect or to an aftereffect of undernutrition during the disease period.

"It appears that during the latter part of the disease the fragility of the red blood corpuscles increases and often the blood samples become hemolyzed. In some cases it was also observed that, when rinderpest was associated with piroplasmiasis or coccidiosis or both, the clear serum samples underwent a process of gelation on standing."

Rinderpest: Clinical syndrome in goats in India, J. D'COSTA and B. SINGH (*Indian Jour. Vet. Sci. and Anim. Husb.*, 3 (1933), No. 1, pp. 122-128, pl. 1).—The authors point out that "rinderpest can be easily maintained in goats by the subcutaneous inoculation of blood taken from affected animals at the height of fever. There are two types of the disease, the acute type which is usually complicated with pneumonic symptoms and the subacute or the uncomplicated form, the principal clinical changes met with being often pneumonic and not alimentary as in bovines.

"The symptoms following upon an artificial infection with rinderpest virus are much less severe in the case of goats in the plains than those observable in goats at Muktesar, and the mortality rate is also noticeably lower. A

correct diagnosis of the disease in goats can always be arrived at from the results of subinoculation of the infected blood into susceptible cattle. The disease can be transmitted from infected to healthy goats by contact and probably to cattle as well."

Epidemic infection of guinea-pigs with *Salmonella enteritidis*, E. JUNGHERR and W. N. PLASTRIDGE (*Jour. Infect. Diseases*, 52 (1933), No. 3, pp. 413-419).—Contributing from the Connecticut Storrs Experiment Station, the authors report upon studies of two paratyphoid epidemics of guinea pigs, one in a commercial and one in a laboratory caviary. The organisms responsible for these epidemics were apparently identical and were closely related to the *S. enteritidis* group, as shown by cross-agglutination and reciprocal absorption tests. Segregation of the animals on the basis of agglutination tests was unsuccessful as a control measure.

The antigenic properties of bacteriophage lysates of *Salmonella suipetifer*, III, IV, P. KENDRICK (*Amer. Jour. Hyg.*, 18 (1933), No. 1, pp. 26-73, pls. 2).—The third contribution (E.S.R., 69, p. 276) deals with the circulating antibodies produced in rabbits in response to injected bacteriophage lysates (pp. 26-52) and the fourth contribution with observations on the antilytic antibody (pp. 53-73).

Protective value of convalescent sera of Sao Paulo exanthematic typhus against virus of Rocky Mountain spotted fever, R. R. PARKER and G. E. DAVIS (*Pub. Health Rpts. [U.S.]*, 48 (1933), No. 19, pp. 501-507, figs. 2).—The sera of six laboratory animals recovered of São Paulo exanthematic typhus, thought to be transmitted by *Amblyomma cajennense*, have been tested for their protective value against the virus of Rocky Mountain spotted fever. Three of these sera afforded complete or essentially complete protection, the fourth a degree of protection nearly as good, while the other two showed definite but less marked protective properties. These results suggest a close relationship between the two viruses.

Experimental studies on human and primate species of *Strongyloides*, I, E. C. FAUST and E. S. KAGY (*Amer. Jour. Trop. Med.*, 13 (1933), No. 1, pp. 47-65).—This contribution, which deals with the variability and instability of types, presents experimental evidence showing the behavior of strains of *Strongyloides* obtained from primate hosts and from human hosts.

Experimental studies on human and primate species of *Strongyloides*, II, E. C. FAUST (*Amer. Jour. Hyg.*, 18 (1933), No. 1, pp. 114-132, figs. 7).—This second contribution (see above) deals with the development of *Strongyloides* in the experimental host. The several stages are traced in sequence from the lungs and upper respiratory tree, via the esophagus into the stomach and lower levels of the digestive tract. The minimum and maximum time limits for these stages are recorded.

Vaccination with heat-killed and formalinized tubercle bacilli in experimental tuberculosis, R. M. THOMAS (*Jour. Expt. Med.*, 58 (1933), No. 2, pp. 227-235, figs. 2).—It was found that rabbits vaccinated with tubercle bacilli killed by exposure to formalin at 0.4 percent did not show any acquired resistance to subsequent infection with bovine tubercle bacilli, while rabbits vaccinated with tubercle bacilli which had been killed by heating to 70° C. for 1 hour survived more than half as long again as their controls.

Undulant fever and its relation to brucellosis in cattle and swine in Virginia, L. E. STARR (*Virginia Sta. Tech. Bul.* 48 (1933), pp. 50, fig. 1).—In the author's studies in Virginia, *Brucella* infection in domestic animals was found to be in general the same as that reported from other sections of the country. It is pointed out that there are relatively few goats in the State

and that these animals did not appear to be a factor in any of the cases of undulant fever studied.

"During the years of 1931 and 1932, 45,285 animals, or approximately 10 percent of the dairy cattle in Virginia, were tested for *Brucella* agglutinins. The sera of 10 percent of these reacted positively. The disease in cattle, however, is widely distributed over the State, with the percentage of infection greatest in the intensive dairy sections. The sera from cattle in 17 dairy herds, consisting of 362 animals that had supplied raw dairy products to individuals who subsequently developed undulant fever, gave a positive reaction in 47.2 percent of the tests. This shows the close relationship of infection in dairy cattle to that in man, and stamps the disease as one of great importance to public health. Of 1,316 samples of [swine] sera tested, 3 percent reacted positively, which indicates that there is some infection in swine in the State. It is of relatively little importance in Virginia, however, either from the standpoint of the livestock industry or of public health.

"*Brucella* agglutinins were found in a small percentage of the sera of the general population. The percentage of positively reacting sera was much greater among those employed in abattoirs and among veterinarians than among the other groups studied. The history of clinical cases of undulant fever among these groups, however, was very low. *Brucella* infection did not appear to be a factor in any of the cases of miscarriages studied in the University of Virginia Hospital. Patients with undiagnosed fevers should be studied closely, as a considerable percentage are found to have undulant fever. Cases of undulant fever have occurred sporadically over the State. There were 70 proved cases of undulant fever reported in Virginia during the period extending from 1929 to 1933. The greatest number were found, however, in the northern part of the State. This corresponds roughly with the area in which *Brucella* infection ran highest in the dairy cattle, and where comparatively little of the milk is pasteurized. About 40 percent of the cases appeared to be the result of contact with infected animals or their discharges, and 60 percent the result of ingestion of raw, contaminated dairy products. The mortality rate from undulant fever is about 1 percent."

The subject is presented in connection with a list of 98 references to the literature.

Undulant fever and its relation to *Brucella* infection (contagious abortion) in cattle and swine in Virginia.—A preliminary report, L. E. STARR and K. F. MAXCY (*Va. Med. Mo.*, 60 (1933), No. 4, pp. 218-227, fig. 1).—This contribution is based upon the work above noted.

Phenyl-mercuric compounds: Their action on animals and their preservative values, L. A. WEED and E. E. ECKER (*Jour. Infect. Diseases*, 52 (1933), No. 3, pp. 354-363).—It is pointed out that "despite the high bactericidal action of phenyl-mercuric salts, they are relatively nontoxic to animals, whether given orally, intraperitoneally, or subcutaneously. Isotonic phenyl-mercuric chloride used to irrigate the bladders of rabbits gave comparatively less inflammatory reaction than did saline solution. A lethal dose of phenyl-mercuric nitrate given intravenously produced acute nephrosis. The digestive action of trypsin and pepsin was not inhibited by the presence of phenyl-mercuric chloride.

"Vaccines prepared by treating cultures of *B[acillus] typhosus* and *B. proteus* with phenyl-mercuric nitrate retained their antigenic power as regards the production of agglutinin. Human serum treated with phenyl-mercuric chloride retained its precipitinogenic power. Diphtheria toxin treated with phenyl-mercuric nitrate for five months retained its original minimal skin reaction

dose. The lytic action of lysozyme was not inhibited by phenyl-mercuric chloride. The presence of phenyl-mercuric chloride did not interfere with the action of complement."

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Idaho Station] (*Idaho Sta. Bul.* 197 (1933), pp. 18, 20-24, 54, 55).—The progress results of investigations on the influence of irrigation on soil fertility, the irrigation of potatoes and beans, chopping alfalfa hay, the duty and cost of tillage equipment, operation of a Diesel tractor, use of ultraviolet light in agricultural production, ventilation and lighting requirements for calf shelters, blending alcohol with gasoline for use as a motor fuel, and the calorific value of wheat used as fuel are briefly presented.

Two forms of full depth control weirs, J. R. KIELY (*Wash. Univ. [Seattle], Engin. Expt. Sta. Bul.* 71 (1933), pp. 34, figs. 16).—Studies are reported the purpose of which was to determine the properties of two groups of full depth control weirs.

The first group consists of those weirs in which the water discharges freely from the orifice without backwater. This situation naturally demands a base coefficient $C=3.27$. The second group contains those weirs of such form as to cause them to select a critical velocity with a base coefficient $C=3.09$. The first group was found to have the advantage of greater discharge with a given opening and backwater, but the second group had greater inherent accuracy.

Neither group was found to be suitable for measuring submerged flow, that is, flow with the downstream depth greater than two thirds of the upstream depth. This was largely because of the turbulence and standing waves where depth must be measured below.

The rating and use of current meters, C. ROHWER (*Colorado Sta. Tech. Bul.* 3 (1933), pp. 133, figs. 88).—The investigations reported, conducted cooperatively by the station and the U.S.D.A. Bureau of Agricultural Engineering, were divided into two parts. The first was devoted to the study of the action of the different types of current meters when rated under various conditions, and the second to the comparison of the discharge determined by different kinds of current meters under various conditions, using different methods of measurement and that from a standard Francis weir.

In order to check the operation and characteristics of the cup and propeller meters under various conditions, representative meters of the different types were rated at both the tangent and rotary stations at the hydraulic laboratory at Fort Collins, Colo. In addition, the rotary- and tangent-station ratings were compared by making ratings at both stations on the same meter under similar conditions. The tangent rating station consisted of a concrete-lined channel 210 ft. long, 5 ft. wide, and 3.5 ft. deep, a variable speed electrically driven rating car, a clock having a seconds pendulum, and an electric recorder for registering the time, the distance, and the meter revolutions.

The consistency with which the plotted points fall on the curves of typical ratings of the principal kinds of current meters made under similar conditions at the tangent rating station is taken to indicate that it is possible to get accurate results with the rating equipment.

Replicate ratings of Price meters made under identical conditions, except that the meters were removed from the car and reset between ratings, gave almost identical results for velocities greater than 1 ft. per second, but showed considerable variation at lower velocities. Ratings of 3 Price cup meters, 1 Ott

propeller meter, and 1 Hoff propeller meter at different depths showed that the depth at which the ratings were made had very little effect on the results except in the case of the cup meters. Under these conditions the cup meters showed some changes, and when at the water surface the changes were so erratic as to make the ratings unreliable. The Hoff meter only of the propeller meters was rated near the surface, and it showed no effect when rated in this position. Nearness to the walls of the channel had little effect on the ratings except in the case of the cup meters. The Price meters ran more slowly than normally, in general, when the rotating force was acting on the cups away from the wall. Integrating the meters while making ratings reduced the speed of rotation of the Price meters but had very little effect on the Ott meters.

Tests made on 2 Price meters, 3 Ott meters, 1 Fteley-Stearns meter, 1 Ritchie-Haskell meter, and 1 Hoff meter showed that all these meters run more slowly when subjected to oblique currents and that the amount of retardation varies with the angle of obliquity and also with the side from which the current comes. The cup meters overregister and the propeller meters underregister in resolving horizontal oblique currents into their axial components. The cup meters overregister less than the propeller meters underregister.

Tests on Price, Ott, Ritchie-Haskell, and Fteley-Stearns meters showed that the propeller meters measure the axial components of vertically oblique currents more accurately than the cup meters, and that the cup meters are more accurate when the current comes from above, whereas the propeller meters are more accurate when the current comes from below. Tilting the cup meters to the right and left had little effect except at velocities less than 2.5 ft. per second.

Tests on a Price meter showed that bending the cups had a marked effect on the rating and that sanding the cups reduced the number of revolutions of meter slightly, but that covering the cups with oil or weighting one of the cups had little if any effect on the rating. The effect of guys on a Price meter to hold it rigidly in place was to cause the meter to rotate more slowly, and the greatest effect was produced by guys of largest diameter. Guys attached near the top of the meter yoke had a greater effect than those attached 3 in. above it, and the effect of the latter was small. Ratings of a Price meter when held by rods of different diameters showed that the revolutions of the meter decreased as the diameter of the rod increased.

Observations on a Price meter and an Ott meter to determine the effect of making ratings in flowing water showed that for velocities greater than 1 ft. per second there is no effect on the ratings.

A comparison of the ratings of a Price cup meter, an Ott propeller meter, and a Hoff propeller meter when supported by rods and cables showed that in general the meters run more slowly when rated as cable meters and that having weights above and below the meters retards them more than single weights, but single weights above the meters make them revolve more rapidly than when the weights are at the bottom. These tests showed also that the Ott meter operated more consistently when rated as a cable meter than either the Hoff or the Price meter.

In general the Price and Ott meters run slower as the length of the cable increases, whereas the Hoff meter runs faster. The difference in length of the cable causes an appreciable difference in the rating of the Hoff meter. Comparison of the cable ratings of a Price meter when using one and two standard weights, both below the meter, showed that the two weights make the meter run more slowly than when the single weight is used.

Ratings of 3 Price meters and 3 Ott meters made at the rotary station under various conditions for comparison with those made at the tangent station

showed that regardless of the radius of rotation the cup meters run more slowly at the rotary station than at the tangent station. This is also true of the propeller meters with the exception of an Ott, which, under certain conditions, runs faster when rated at the rotary station than when rated at the tangent station, but the difference is small.

As the radius of rotation decreased, 2 Price meters ran more slowly, whereas 1 Price meter and 2 Ott meters ran faster. One Ott meter was apparently not affected by the radius of rotation. The cup meters ran more slowly at the rotary station than at the tangent station, regardless of whether the rotating force was acting on the inside or the outside cups.

The ratings made with and without tails at the rotary station on a Price meter and 2 Ott meters showed that the Price meter runs faster without than with the tail, regardless of the direction of rotation of the meter, and that the Ott meters under some conditions run faster and under others slower when operated without the tail, whereas the ratings made at the tangent station showed that the tails have little if any effect on the ratings.

The addition of guy wires to hold the meters more rigidly did not make the rotary- and tangent-station ratings of the meters agree.

Ratings of 2 Price meters at the rotary station at a constant radius showed that the revolutions of the meters increased as the depth increased, up to a depth of 2 ft., and that from there on the revolutions decreased for the most part. With the exception of the rating of 1 Price meter at the 2-ft. depth, the meters run slower at the rotary station than at the tangent station.

Observations at the rotary station on 2 Price meters when held rigidly by the supporting rod and when free to turn in a horizontal plane showed that in general the meters run faster when free to turn, and that when the rotating force is acting on the outside cups and the meters are free to turn in a horizontal plane the meters run at about the same speed at the rotary station as they do at the tangent station.

The tests made on a Price meter to find out how much the theoretical radius of rotation had to be increased to make the rotary and tangent ratings coincide indicated that, if when the rotating force is acting on the inside cups the meter is set on a radius about 1 percent greater than that used in computing the velocity, the ratings will agree.

The ratings of the current meters used in making the comparisons between the weir and the current-meter measurements showed that although the equations of the ratings made at different times differ slightly, there are compensating factors in the equations which make the velocities computed from the equations of ratings agree quite closely with each other.

The tests showed that both cup and propeller meters are inaccurate in shallow flumes, and that the errors increase, in general, as the depth decreases. The Price cup meter gave the best results when the vertical-integration method was used, but the Ott and the Hoff propeller meters were most accurate when the measurements were made by the 2-and-8-tenths method. In view of the fact that the errors in the measurements with each meter and by each method are quite consistently too large or too small, it seems obvious that the accuracy of the measurements in shallow water could be materially increased by applying the correction derived from these tests for the meter and the method.

The results of a series of current-meter measurements made in the converging section of Parshall measuring flumes indicated that more accurate current-meter measurements might be made if the gagings were made in structures with converging rather than parallel walls.

The canvas hose system of irrigation, G. AMUNDSON (*Agr. Engin.*, 14 (1933), No. 8, pp. 207-209, fig. 1).—In a contribution from Michigan State

College, the canvas hose system of irrigation is briefly described and the results of service tests with potatoes reported.

Tile drainage in the orchard, C. W. ELLENWOOD and J. T. McCLURE (*Ohio Sta. Bimo. Bul.* 163 (1933), pp. 95-100, figs. 2).—A brief account is given of experience at the station on the drainage of orchards. Practical information is given on proper procedure.

[**Soil erosion investigations at the Wisconsin Station**] (*Wisconsin Sta. Bul.* 425 (1933), pp. 55-58, figs. 2).—The progress results of investigations at the soil erosion experiment station near La Crosse are briefly presented. These are conducted jointly by the station and the U.S.D.A. Bureaus of Agricultural Engineering and Chemistry and Soils and the Forest Service.

Field observation of soil erosion index variants, J. T. COPELAND (*Agr. Engin.*, 14 (1933), No. 8, p. 206).—In a contribution from Mississippi State College, field observations are briefly reported of the reaction of the many soil and crop variables and their response to the soil erosion index method of determining terrace location, grade, and direction.

It is concluded that soil components rather than percentage of slope or soil type influence the intervals of erosion. A soil of a given slope, under uniform cultural practices, may change the erosion interval on that slope either in factors or by multiples of factors. A soil formerly with uniform erosion interval may change in response to cultural practices either in multiples or by factors. The principles underlying erosion index practices change with the constant physical variants of the soil, and the accuracy with which the erosion indices are interpreted and followed facilitates the precision with which the resultant terrace location, grade, and direction coincide with the erosion planes or belts peculiar to the particular soil.

Hydraulic machinery, D. W. MEAD (*New York and London: McGraw-Hill Book Co.*, 1933, pp. X+396, pl. 1, figs. 202).—The purpose of this book is to present technical information to assist practicing engineers in the selection, installation, operation, and maintenance of hydraulic machinery. It contains chapters on energy, energy of motion, efficiency, duty, detailed analysis of energy losses, losses in various machines and appurtenances, power and transmission systems, pumping machinery—general conditions, direct lift or bucket pump, reciprocating pumps, work in the cylinders of reciprocating pumps, the use of steam for pumping, centrifugal pumps, the air lift pump, siphon, and the hydraulic ram.

On the behavior of siphons, J. C. STEVENS (*Amer. Soc. Civ. Engin. Proc.*, 59 (1933), No. 6, pp. 925-944, figs. 10).—Results of field tests of three siphons having nominal capacities of 100, 250, and 500 sec.-ft. are reported. Pressure gradients, as well as pseudo- and true-energy lines are given. A simplified conception of the action of siphons is presented, involving an analogy to free flow and submerged orifices. There is also offered a method of comparing siphons by a standardized coefficient of flow and a standard expression for the efficiency of a siphon.

Durability of posts and results of preservative treatment, D. G. CARTER, H. T. BARR, and J. B. WOODS (*Arkansas Sta. Bul.* 287 (1933), pp. 16, fig. 2).—This bulletin reports the progress of laboratory and field studies extending over a 10-year period, from 1923 to 1933, on the life of fence posts and the use of preservative treatments for post woods. Three phases of the study are reported: (1) The durability of fence posts in service, (2) tests of preservative treatments on pine and oak specimens, and (3) the use of toxic chemicals and other preservatives in the control of wood-destroying fungi.

On the basis of 10 years of service tests, 7-year tests of wood specimens in the field, and laboratory studies of toxicity, it was found that pine posts creosoted

by the pressure process were entirely sound after 10 years' service. Galvanized steel posts showed no deterioration after 10 years' service. Painted steel posts are satisfactory, but the coating is not weather resistant, and posts are subject to corrosion. Home creosote treatment of oak posts gives an apparent increase of about 4 years in length of satisfactory service. Fifty percent of the test posts were sound after 10 years. Creosote was the most generally effective preservative in all tests.

The use of insecticides and fungicides, such as lime-sulfur spray and lubricating oil emulsion, did not prevent wood decay, although destruction was retarded somewhat when compared with untreated specimens. Used motor or cylinder oil without dilution or emulsification gave definite indications of effectiveness. Best results were secured when treatments were of short duration and at the lower temperatures. In field tests, zinc chloride treatments were found to be effective in preservation and may readily be adapted to home treatment.

Molten sulfur offered some mechanical resistance to decay. Copper compounds precipitated in the wood were found to be highly toxic to wood-destroying fungi.

This project indicates the desirability of further study on (1) the effect of length of treatment on durability, (2) the use of used motor oil as a preservative, (3) the use of chemicals in contact with the wood in the soil, (4) the value of copper compounds soluble in weak acids, and (5) treatment with and effect of zinc chloride as a preservative.

Analysis and design of steel structures, A. H. FULLER and F. KERESKES (*Ames, Iowa: Authors, 1933, pp. XIII+451, pls. [2], figs. [381]*).—This is a handbook of information for structural engineers, containing chapters on reactions, stresses in framed trusses, stresses in trusses for moving loads, beams, plate girders, design of steel roof trusses, industrial buildings, economic factors governing the proportions of simple span bridges, design of truss bridges, deflection of trusses and statically indeterminate structures, multistory buildings, and continuous frames and secondary stresses.

Indiana big team hitches, P. T. BROWN (*Purdue Agr. Exten. Bul. 196 (1933), pp. 8, figs. 12*).—Practical information is given on the use of big team hitches adapted to from 4 to 9 horses.

Importance and prospects of the small tractor in rural domestic pursuits [trans. title], C. H. DENCKER and L. W. RIES (*Schr. Reichskurator. Tech. Landw., No. 42 (1933), pp. 46, figs. 9*).—This is a presentation of practical information on the economic use of the small general-purpose tractor on small German farms varying from 12.5 to about 50 acres in size. It is based on a survey of power requirements and utilization on such farms in four German provinces and discusses the use of horses, oxen, and draft cows, as well as of the small tractor on a community basis, a custom basis, and an individually owned and used basis.

Comparative test results of rubber tires and steel wheels for tractors, L. W. HURLBUT (*Agr. Engin., 14 (1933), No. 8, pp. 217, 218*).—The results of comparative tests of steel wheels and low-pressure rubber tires conducted at the Nebraska Experiment Station are briefly reported.

It was found on the tractor-testing track that for any given engine horsepower a greater drawbar horsepower was obtained with rubber tires than with steel wheels and lugs. With rubber tires the maximum drawbar pulls in low, second, and high gear were nearly the same. Steel wheels and lugs had the advantage in both drawbar pull and speed in low and second gear. In high gear, steel had the advantage in speed up to a drawbar pull of 1,250 lb. Rubber tires had a considerable advantage in drawbar pull with a maximum pull of 2,190 lb. in high gear. The maximum drawbar pull for rubber tires was 2,230

lb. in second gear. For steel wheels and lugs it was 3,200 lb. in low gear. The rubber equipment showed the better fuel economy based on drawbar horsepower, and high gear with rubber showed the maximum fuel economy. The maximum drawbar horsepower developed with rubber tires was in high gear and with steel wheels in low gear. The direction to best fuel economy with rubber tires is higher speeds, with the drawbar pull remaining nearly constant. The most efficient drawbar load in this test was near 1,800 lb.

Field observations showed that the traction in mud of a tractor equipped with rubber tires, without chains, is similar to that of an automobile or truck. Rubber tires equipped with lug-type chains will pull as much as the steel wheels and lugs on dry soil, and more in muddy conditions. A creeping, oscillating movement of the lug-type chain keeps them clean in soil conditions that fill up the steel wheel with fixed lugs.

It was also found that a tractor with rubber equipment pulled a subsoiler at a greater depth in second gear than it did in second or low gear when equipped with steel wheels and lugs. However, the rubber tires tended to pack the soil.

Certain technical aspects of motor fuels, J. C. MORRELL (*Agr. Engin.*, 14 (1933), No. 8, pp. 220-222, fig. 1).—This is a brief critical summary of progress in the development of fuels for internal-combustion engines, with particular reference to the cracking process in gasoline extraction, the production of anti-knock fuels, and the like. Data are quoted from experimental findings to indicate no particular advantage from the blending of gasoline and alcohol.

Tests of multiple fuels in an injection motor [trans. title], M. CLERGET (*Compt. Rend. Acad. Sci. [Paris]*, 196 (1933), No. 22, pp. 1645-1647).—Tests are reported which showed that the admixture of ethyl alcohol with heavy fuel oil in an injection type internal-combustion engine resulted in the same power output as where gasoline was used, but at a considerably increased thermal efficiency. The use of the ethyl alcohol resulted in more complete combustion, as indicated by the composition of the exhaust.

The relative lubricating values of automotive oils, H. H. LANGDON (*Wash. State Col., Engin. Expt. Sta., Engin. Bul.* 41 (1932), pp. 15 fig. 1).—Laboratory and service tests are reported, together with practical information on the subject. Six different series of tests were conducted over a period from 1925 to 1932, and included approximately 9,400 miles of automobile operation and more than 800 hours of laboratory, harvester, and tractor operation. The studies were confined mainly to the relative values of paraffin- and asphalt-base oils.

The harvester and tractor engines showed a far greater rate of wear than the automobile and laboratory engines. Wear proceeded in the harvester engine 7 times more rapidly than it would have occurred under laboratory conditions, and in the tractor engine wear proceeded at 18 times the laboratory rate. This increased rate of wear can be explained by the severe dirt and dust conditions under which the tractors operate when compared to operation under laboratory conditions. Wear increased with the dryness of the season. In the first part of the season when the ground was still damp from the spring rains, a relatively small wear occurred in the individual runs. In oil analysis procedure it was observed that high iron content in the individual samples was coincident with high alumina and silica content.

The conclusion is drawn that to the consumer the so-called physical property tests of lubricating oils are of value chiefly for the purpose of identification and for making certain that the oils purchased are up to the manufacturer's specifications.

Viscosity tests are of value in adapting a lubricating oil to the needs of an engine and for the identification of oils, but do not necessarily indicate the

lubricating value of an oil. A paraffin-base oil, as a rule, maintains a more uniform viscosity with use than does an asphalt-base oil.

Distillation tests and flash and fire tests are useful for identification and refinery control, but it is doubtful if there is any direct relation between these tests and lubricating value. Cloud and pour tests may be important for selecting oils to be used in extremely cold weather but are not a guide in determining lubricating value for normal operation.

An oil testing high in carbon residue does not necessarily possess inferior lubricating properties. The tests indicate that oils with high initial carbon residue have superior lubricating ability, although the study would seem to indicate that there is no direct relation between the two. The carbon residue test should be used only as a means of refinery control and identification. Other influences, such as leakage past the rings, seemed much more important in forming carbon deposits.

Operation under dusty conditions, such as farm work, reveals the desirability of dustproofing such engines. In these tests excess wear due to dust reached as high as 2,000 percent, and consequently the comparative value of any lubricant was accordingly diminished. However, even in this case somewhat less wear was shown for the paraffin-base oil. In the comparative tests, leakage and pumping losses were greater by as much as 6 percent with the asphalt than with the paraffin-base oils. In automobile, laboratory, and field operation of the automotive engines used in these tests, an average of 54 percent greater wear of the working parts took place with typical asphalt-base oils than with typical paraffin-base oils.

Oklahoma wind-electric power, E. B. KURTZ (*Okla. Engin. Expt. Sta. Pub. 10* (1931), pp. 14, figs. 7).—The results of studies of a wind-electric power plant consisting of a windmill, geared generator, switchboard, and storage battery are reported. The windmill consisted of a 2-blade aeroplane-type propeller 10 ft. in diameter. The procedure consisted of taking observations of wind movement and of kilowatt-hours of electricity generated during the period when the windmill was free to run and charge the battery.

The data on wind movement in relation to kilowatt-hours generated show that the plant can be expected to generate about 2 kw.-hr. for every 100 miles of wind movement, or 0.02 kw.-hr. per mile of wind. As the velocity of the wind increased the electricity generated per mile of wind movement increased also. The most probable values seem to lie between 0.02 and 0.03 kw.-hr. per mile of wind.

Data are also given on average monthly wind movements in Oklahoma over a period of 20 years, indicating a maximum wind movement of 14,005 miles in March 1917 and a minimum movement of 5,654 miles in July 1923.

The conclusion is drawn that a wind-electric plant has great possibilities in a State like Oklahoma. There should be no question about the adequacy of the plant to supply the lighting load on an average farm. In general it should also be able to supply electricity for washing, ironing, toasting, cleaning, fans, and a small amount of small motor load, such as water pumping for household purposes. Beyond this there would be no assurance that electricity would always be available.

Influence of electricity on plants [trans. title], N. ARONOVICH (*Elektrif. Sel'sk. Khoz.*, 2 (1932), No. 3, pp. 40-49, figs. 10).—Experiments are reported on the effect of electricity on the growth of cabbage, tomatoes, and peppers in the field, indicating an average increase in yield of 22 percent. The data are presented graphically and otherwise, but no conclusions are drawn.

Plant cultivation with the aid of electric light: A report on investigations in Sweden, S. ODÉN, G. KÖHLER, and G. NILSSON (*Internatl. Illum.*

Cong. Proc., 1931, vol. 2, pp. 1298-1326, figs. 13; *Fr. abs.*, p. 1298; *Ger. abs.*, pp. 1298, 1299).—The substance of this report has been noted from another source (*E.S.R.*, 67, p. 609).

A new use for electricity in plant culture [trans. title], J. O. Musso (*Fortschr. Landw.*, 8 (1933), No. 12, pp. 272-274, figs. 6).—A brief account is given of a series of experiments conducted in Leningrad on the artificial strengthening of the electrical field over crop plants. Several different types of crops were used, including especially oats, radishes, and spinach.

It was found that only that part of an electrical field in intimate contact with plants has any influence on them. The electrical field between a charged wire netting and uninsulated soil was not changed, whereas it was strengthened when the soil was insulated and the charged wire netting grounded.

By omitting the wire netting and connecting the batteries to the field through a condensor a field of constant strength was obtained which hastened the flowering of oats and radishes by 12 days. The yields were larger in summer and smaller in the fall by use of a positive than by a negative soil potential.

The artificially created electrical field was especially effective during bad fall weather when the natural field was weak.

Artificial illumination in the greenhouse [trans. title], K. VOGL (*Internatl. Illum. Cong. Proc.*, 1931, vol. 2, pp. 1327-1333; *Fr. abs.*, p. 1327; *Eng. abs.*, p. 1328).—An explanation is given of the influence of light as a growth factor on plant growth, it being pointed out that, of the visible spectrum, plants need mainly the long-wave red rays and the short-wave blue rays. For this reason the electrical incandescent lamp is fitted for lengthening the natural day in winter.

Comprehensive researches were carried out in a flower nursery on a large group of plants comprising begonias of the Lorraine type and hortensias. The first two series of observations gave for illuminations of 835 and 120 lux, lasting in each case 3 hours before sunrise, equally good improvement in growth. The two following investigations gave as the most favorable duration the value which lengthens the natural day to 12 hours. Fifteen hours of light was equally effective but less economical. With an illumination of from 100 to 150 lux and a prolongation of the day to 12 hours of light, an appreciable increase in the net profit was obtained as compared with the normal culture of begonias and hortensias.

Electric light on the farm, R. B. MATTHEWS (*Internatl. Illum. Cong. Proc.*, 1931, vol. 2, pp. 1279-1297, figs. 18; *Fr. abs.*, p. 1279; *Ger. abs.*, p. 1280).—This paper deals with practically every known use of electric light on the farm.

In connection with lighting as a means merely of illumination for farm buildings and yards, data are given regarding the correct methods of illuminating the various farm buildings and the most suitable types of reflectors, and the like. Reference is made also to a method of lighting farm yards.

The part relating to lighting as a direct medium of increasing the productivity of the farm deals fully with the methods employed and the advantages resulting from lighting the poultry laying houses during the winter months. The various methods of controlling the lights and providing a dim light are described, and data are given for determining the number of lights and type of lamps needed to meet ideal poultry house requirements. The treatment of plant life by intensive illumination is discussed, and a table is given showing the best intensities of light for making plants bloom and produce seed. Details of the author's experiments to ascertain the commercial possibilities of intensive illumination are described.

The latest development in the use of the ultraviolet rays for irradiating farm stock and foodstuff is described, and the results of some experiments in this connection are given.

Special fertilizer boxes for plat work, J. G. LILL (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 1, pp. 84-86, figs. 4).—In a contribution from the U.S.D.A. Bureau of Plant Industry, special fertilizer boxes are described which were built so that the fertilizer application rate could be varied from as low as 50 lb. per acre to as high as 1,000 lb. by relatively small intervals, depending upon the ratio of the sprocket wheels used that operated the mechanism and the opening of the fertilizer feed gate. These boxes are adapted only for plats ranging from 50 to approximately 500 ft. in length.

Methods of field plot investigations with cotton production machinery, J. W. RANDOLPH (*Agr. Engin.*, 14 (1933), No. 8, pp. 210-212, fig. 1).—The field plat experiments described in this paper are a part of a cooperative investigation conducted by the U.S.D.A. Bureau of Agricultural Engineering and the agricultural engineering departments of the Alabama and Mississippi Experiment Stations. The objects of the field studies are to determine the effects of tillage machine operations on the growth of the cotton plant, to find the most economical methods of utilizing this machinery, and to furnish a basis for the development of needed equipment. These investigations are supplemented by special field tests and by laboratory and greenhouse studies of soil dynamics and tilth.

Tests of silage cutters [trans. title], G. SEGLER (*Technik Landw.*, 14 (1933), No. 6, pp. 134-138, figs. 8).—Tests of four types of silage cutter and blower conducted at the Farm Machinery Institute of the Prussian Agricultural Experiment Station at Landsberg are reported. Special attention was given to the blower attachments. The crop was green corn with a water content of 77.4 percent which was cut into lengths of 11 mm (0.433 in.).

The cutting capacity increased with the speed of the knives. The power requirement for pressing the material into the throat was greater than for cutting. However, the total power requirement increased in direct proportion to the speed. Also it was found that high speed accomplishment is adapted to high elevation of the cut material and the use of high speed adjustments with low elevations wastes power.

A special testing tower about 80 ft. high was used for experiments with the blowers and the throwing or discharging blast, in which capacities varying from 1 to 2.5 kg (from 2.2 to 5.5 lb.) per second were used. In these tests the diameter of the fan wheel was not so important, but the speed of the blades assumed considerable significance. Form and location of the blades were not important. However, the shorter blades placed in a radial manner gave the best results.

It was found that the theoretical height of elevation is only approximately proportional to the square of the velocity of rotation of the fan, and becomes less so the greater the quantity of material moved and the consequent increased friction with the sides of the blower.

In the interests of power economy it was found desirable not to exceed a wind velocity of 15 m (49 ft.) per second.

Artificial drying of hay [trans. title], M. EVREINOW (*Elektrif. Selsk. Khoz.*, 2 (1932), No. 3, pp. 19-35, figs. 15).—Graphic and other data are presented from experiments conducted in Russia on the drying of hay at low temperatures of from 30° to 36° C. (86° to 96.8° F.) to the point at which 80 percent of the moisture is removed. At this point the temperature is increased to 100° for final drying. It has been found that high drying temperatures constitute a fire hazard and also reduce the nutritive value of the hay (*E.S.R.*, 69, p. 287).

The State College of Washington experimental fruit washer, H. L. GARVER, H. J. DANA, and F. L. OVERLEY (*Washington Col. Sta. Bul. 285 (1933)*, pp. 28, figs. 8).—This contribution from the station, the Washington Committee on the Relation of Electricity to Agriculture, and the engineering experiment station describes the details of an experimental fruit washer.

The machine is divided into five separate sections, each playing an important part in the washing process. The first section consists of a dump table and leaf eliminator, the second is a prewash section, and the third is the actual wash section equipped to permit the use of either rollers or underbrushes. The fourth section is an overbrush rinse section, but it may be used for washing if desired. The fifth section is a final rinse in which the only operation is that of flooding water over the fruit, which rotates as it is carried along by the roller conveyor.

The wash section of the machine is equipped with three electrical heating units of 5 kw capacity each. Each is controlled by its own switch. This arrangement aids in the control of the temperature of the solution in the wash tank. Although this experimental machine is not equipped with thermostatic control, it is considered advisable that such equipment be installed.

Cost of operation tests showed that the power requirement for operating this small sized machine will not be in excess of 3 kw, even when full of fruit. Therefore a 3-hp. motor will be sufficient to drive it. The three heaters are rated at 5 kw each, hence the total energy consumption will be about 18 kw.-hr. per hour with the entire electrical equipment in operation. The cost of electrical energy for operating the machine and heating the solution in the wash section will be 54 c. an hour (based on a rate of 3 c. per kilowatt-hour) when all the heating capacity is being used.

Farm structures, E. R. JONES (*Madison, Wis.: Author, 1933, pp. 197+[3], figs. 129*).—This is a popular treatise giving practical information on differential leveling; measuring distances; areas, angles, and topographic maps; tile drainage systems; control of surface water; farmstead, fields, and fences; capacity and requirements of buildings; concrete foundations and pavements; strength of frame structures; heating and ventilating; water supply and sewage disposal; and cost estimates.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics at the Ohio Station] (*Ohio Sta. Bimo. Bul. 163 (1933), pp. 110-114*).—Investigations are reported on as follows:

Some factors of success in sheep raising, F. L. Morison (pp. 110, 111).—A table based on complete flock cost records secured from approximately 70 farms each year, 1930-32, shows some of the factors contributing to profits or loss, comparison being made of the 10 most and the 10 least profitable flocks and all flocks.

Comparative prices of Ohio farm products, J. I. Falconer (p. 111).—A table shows for each of the important Ohio farm products the average prices, 1910-14, 1925-29, and 1932, and the indexes of the prices (1910-14=100) for 1921-24, 1925-29, 1932, and April 1933.

Index numbers of production, prices, and income, J. I. Falconer (p. 112).—The table previously noted (E.S.R., 69, p. 600) is brought down through April 1933.

Also included is a brief article by V. R. Wertz (pp. 113, 114) on agricultural production not the only cause for low prices of farm products.

[Investigations in agricultural economics at the Wisconsin Station, 1931-32] (*Wisconsin Sta. Bul.* 425 (1933), pp. 34-50, figs. 4).—Reports of investigations are noted as follows: Factors influencing demand for cheese, by A. Hobson, R. K. Froker, A. C. Hoffman, D. S. Anderson, and M. A. Schaars (pp. 34-39); marketing Wisconsin potatoes, by H. H. Bakken and J. W. Brann (pp. 39, 40), a survey of potato market conditions in Chicago and other important consuming centers; prices of farm products in Wisconsin, by W. P. Mortenson, J. H. Draxler, O. C. Stine, H. H. Erdman, and W. H. Ebling (pp. 40, 41), a study of farm prices from about 1845 to date; dairy farm incomes, by D. R. Mitchell and P. E. McNall (pp. 41, 42); land economic survey of Washburn County (pp. 43-47), in which the farm development of the county, the possibilities for further development of recreational facilities, taxes and tax rates, State aid, and tax delinquency in the county are briefly discussed; and reduction of governmental costs through enlargement of administrative areas, by G. S. Wehrwein, R. F. Spilman, and B. W. Allin (pp. 47-50), in which suggestions are given for possible economies through modification of the boundaries and functions of local governmental units.

Agricultural conditions on the Huntley [Mont.] reclamation project (*U.S. Dept. Agr., Tech. Bul.* 353 (1933), pp. 4-7).—Tables are given showing, by years, the acreage of principal crops, 1913-30, and the number of different kinds of livestock, fowls, and hives of bees on farms, 1914-30.

Incomes and expenses on the larger properties in the Merced Irrigation District during the years 1926, 1927, and 1928, M. R. BENEDICT (*California Sta., 1933*, pp. 15).—This is a supplementary memorandum to the report previously noted (*E.S.R.*, 69, p. 293). Tables show for 1926, 1927, and 1928, and the total for the period, the acreage, gross income, expenses, county and district taxes, net income before and after paying taxes, and cost of permanent improvements of 26 corporations and individuals operating in the irrigation district.

Labor and power used in crop production in central Indiana, E. C. YOUNG and G. W. COLLIER (*Indiana Sta. Bul.* 378 (1933), pp. 28, figs. 10).—This study was made in cooperation with the Bureau of Agricultural Economics, U.S.D.A., and is based on information obtained from 100 to 125 farms each year 1929-31. The data were gathered by visits to each farm each year by a field man who obtained seasonally the field operations and the labor, power, equipment, and materials used in growing and harvesting important crops.

Tables and charts are included and discussed showing the organization of the farms studied, the farms being grouped as small (less than 125 acres), medium (125 to 225 acres), and large (over 225 acres); the hours per acre required to perform different field operations in growing crops with different power units; typical crew, number of acres handled per 10 hours, and man, horse, truck, and tractor hours per acre used for different harvesting operations; the crew, acres per 10 hours, days of work, and man, horse, and tractor hours per acre used in different operations in growing corn, wheat, and oats with different types of production, and of soybeans and tomatoes; the labor and power units per acre in growing and harvesting corn, wheat, oats, soybeans, hays, and tomatoes; and the labor, power, and materials used per acre in producing corn with different acreages, hays pitched and loaded with a loader, and wheat, oats, and soybeans threshed with stationary threshers and with combines.

The application of the results to individual problems is discussed.

Some important factors affecting costs in hog production, R. H. WILCOX, W. E. CARROLL, and T. G. HOENUNG (*Illinois Sta. Bul.* 390 (1933), pp. 60,

figs. 11).—This bulletin is based on 106 hog-cost records kept by 34 to 37 central Illinois farmers for the 3-year period 1924–26. Analyses are made to show the variations in profits in producing 100 lb. of pork, quantities of feed of different kinds and labor used, distribution of cost between items, differences in factors entering into costs on high- and low-cost farms, the costs of the breeding herd, cost of producing a weaned pig and the factors affecting such cost, the cost of producing pork after weaning and the factors affecting such cost, the costs with the 1-litter and the 2-litter systems, and the costs on farms using gilts and those using sows and on farms with early- and with late-farrowed pigs.

A detailed outline of the various factors that affect profits in hog production is included.

A study of North Carolina dairies, R. H. ROGERS (*North Carolina Sta. Bul.* 288 (1933), pp. 35, *fig. 1*).—Data regarding the dairy and other farm business for the year ended June 30, 1931, were obtained and tabulated from 10 dairymen producing solely for the wholesale trade, 20 producers who retailed their output, and 2 who both retailed and wholesaled. Some of the findings were as follows:

A dairy can be profitably conducted in North Carolina. Number of cows is not a limiting factor in determining profits. Extremely high production per cow is not always warranted. Uneconomical use of labor was an outstanding fault in many of the dairies. Excessive overhead charges ran up the production costs on several of the farms.

The average earning on investment was 4.22 percent. For the retail dairies, costs averaged 10.8 c. and sales 13.3 c. per quart. Of the cost, exclusive of inventory charges and livestock purchases, production labor represented 12.4 percent, feed 45.6, distribution expense 24.1, interest and overhead 9.2, and other costs 8.7 percent. The net cost per cow averaged \$307.36. For the wholesale dairies, milk cost \$3.11 per 100 lb. and sold for \$3.54. Labor made up 15.3 percent of the costs, feed 50.1 percent, distribution 13.6, interest and overhead 9.8, and other costs 11.2 percent. The net cost per cow was \$190.53.

The study was made in cooperation with the North Carolina Department of Agriculture.

Seasonal variation in milk production under the basic rating plan, H. C. FOWLER (*Vermont Sta. Bul.* 353 (1933), pp. 32, *figs. 14*).—This study was made to examine the changes in seasonal variation of milk production which followed the adoption of the “modified sales plan” adopted January 1930 and of the “basic rating plan” adopted in September 1931; to compare the seasonal distribution of milk production, 1927–31, by members of the New England Milk Producers Association which adopted the rating plan with a group of milk producers not affected by any rating plan; to compare the response to the basic rating plan in a summer dairy and a winter dairy region; to ascertain the methods being used to adjust the seasonal variation of milk production; and to determine what adjustment seems most feasible and profitable. It is based upon data relating to milk deliveries made continuously through the period 1927–31 from 274 farms in 4 districts in northern and central Vermont, 2 being summer producing areas and 1 a winter producing section selling under the basic rating plan and 1 a summer producing area not under any rating plan. Farm business records covering the year beginning May 1, 1931, were also obtained from 204 of the farms.

The four districts are described with tables showing the number of cows, acreages of crops and pasture, distribution of capital and of receipts, milk and grain prices, etc. Other tables and charts show for each district, 1927–31,

the average monthly deliveries of milk per farm, the monthly production for each district expressed as percentages of the average monthly production for each year, the coefficients of variability of the combined production in each district, and the percentages November deliveries were of June deliveries.

Other tables show for the different districts the percentage of farmers using different means of evening production; the percentage of cows freshening in different months; correlation constants between average price of milk, fat test of milk, and percent basic ($100 \text{ (Oct. to Dec. 1931 deliveries + Sept. to Nov. 1932 deliveries)} \div \text{Total deliveries May 1931 to April 1932}$); the regression equations for estimating the price of milk from the fat test and the percent basic; and the bearing of differences in the seasonal distribution of production, as measured by differences in percent basic, upon labor incomes. Charts are also included showing for each district the relation, 1931-32, of test of milk and of percent basic to price per 100 lb. of milk.

The three districts affected by the basic rating marketing plan adopted within the period increased fall production in the later years more than did the farmers in the other district. The deliveries of the basic plan producers at the close of the period tended to be more nearly in accord with fluid milk requirements, the violent seasonal fluctuations having largely disappeared. Breeding more cows to freshen in the fall, feeding more grain in the fall, and providing better fall pasturage were the methods generally used in adjusting milk production. The farm business records showed that in the case of the basic plan producers changes in the ratio of basic to total production were associated with differences in the average prices of milk and in labor incomes, while in the case of nonbasic producers no significant relationships were found. Notwithstanding that abnormal price fluctuations and a change in the marketing plan during the year beginning May 1, 1931, tended to lessen the influence of differences in seasonal distribution of production upon the financial returns of farmers in the areas under the rating plan, the labor incomes of producers with relatively high basic ratings were consistently higher than those with low ratings.

The California muscat grape outlook, G. M. PETERSON and S. W. SHEAR (*California Sta.*, 1933, pp. [3]+26+XVIII, figs. 11).—This is a study of the economic situation of the industry. The raisin grape acreage and production in California, 1909-32, the trend of raisin production and muscat grapes in California and foreign countries, farm prices of raisins, the position of muscats in the raisin trade, the sales of raisins in different types of pack, the outlets for fresh muscat grapes, and the outlook for fresh muscat grapes and muscat raisins are discussed.

The authors state that the results of the study "do not indicate that the future of the muscat industry is hopeless, but offer considerable evidence for the belief that the domestic market still offers a sufficient demand for a limited amount of muscat raisins and fresh muscat grapes to justify the maintenance of much of the muscat acreage in the state of a productive quality and capacity equal to or above the present average."

Britain's new wheat policy in perspective, A. F. WYMAN, J. S. DAVIS, ET AL. (*Wheat Studies, Food Res. Inst. [Stanford Univ.]*, 9 (1933), No. 9, pp. [1]+305-350, figs. 10).—In 1932 the United Kingdom made significant departures in her wheat policy. Since the repeal of the Corn Laws in 1846, cheap food had been a cardinal doctrine. Taxes on bread and protective duties and subsidies for domestic wheat growers had been avoided.

In effect, flour is now taxed and wheat growers subsidized. The new measures are viewed by the authors as both ingenious and moderate. They are

directed toward farm relief, rather than self-sufficiency, within the British Empire. The influence of these measures on the world wheat situation will not be large, but may retard the solution of world wheat surplus problems. The new policy, however, means the reorientation of British agricultural policy in which animal husbandry strongly predominates.

The new program calls for far-reaching experiments in commodity control and agricultural planning, the outcome of which cannot be safely predicted.

Costs of marketing Virginia livestock, P. L. FLETCHER (*Virginia Sta. Bul.* 288 (1933), pp. 36, figs. 4).—"This bulletin presents the results of a study of the costs of marketing heavy southwest Virginia grass-fed cattle and Virginia spring lambs at Jersey City, together with an analysis of some of the factors affecting these costs." Jersey City as a cattle and lamb market and the transportation facilities and charges thereto from Virginia are described. Local, transportation, and central market costs for cattle and sheep are discussed. Tables show the monthly receipts, 1928-31, of Virginia cattle and sheep and lambs at Jersey City; the gross and net shrink on 55 shipments and the fill on 59 shipments of heavy grass-fattened cattle; the variation in size of loading of lambs in single- and double-deck cars, the death and cripple losses of lambs; and the shrinkage on shipments from different areas of the State.

Correlation analyses are made of the relation (1) between gross shrink of cattle and miles driven to home scales, rainfall on day previous to weighing at the farm, temperature on day weighed at home, miles from home scales to loading point, hours in transit, average farm weight, and loading weight per car; (2) between fill of cattle of maximum temperature on sale day, gross shrink, average farm weight, and hours in sale yard; and (3) between shrink for lambs and distance driven before loading, hours in transit, car floor space per 100 lb. of loading weight, hours in sale yard, pounds of hay fed at market, and maximum temperature on sale day.

The average cost in 1929 of marketing heavy grass-fattened southwest Virginia cattle at Jersey City was 1.06 c. per pound, the shrink being calculated at 8 c. per pound. A 1 c. per pound change in the market value changed the average cost of marketing 0.05 c. per pound farm weight. The average farm weight per head of the shipments studied was 1,526 lb., the average gross shrink 131 lb., the average fill 56.5 lb., and the average net shrink 75 lb., or 4.9 percent of the farm weight. The gross shrink on individual shipments varied from 6.1 to 11.6 percent of the farm weights, 82 percent of the shipments being between 7.6 and 9.6 percent. Seventy-five percent of the shipments showed net shrinks between 4 and 6 percent of the farm weights. The average reduction in apparent gross shrink for each mile driven before weighing for shipment was 13 lb. for a 1,500-lb. steer. One-half inch increase in the rainfall the day previous to weighing was accompanied by about 13 lb. reduction in the shrink. None of the other factors considered showed a simple correlation coefficient with gross shrink greater than 0.08.

Maximum temperature at the market when weighings were made was closely related to the amount of fill, that with 80° F. averaging about 20 lb. per head greater than that with 30° F. Cattle with large gross shrinks filled more than those with small shrinks. The heavier animals took less fill in proportion to their weight. No significant relation was found between hours in the sale yard and the amount of fill.

The average cost of marketing lambs in Jersey City in 1929, the shrink being charged at 10 c. per pound, was 1.91 c. per pound farm weight for southwest Virginia and 1.55 c. for northern Virginia for lambs shipped in double-deck cars and 2.04 and 1.67 c., respectively, for lambs shipped in

single-deck cars. The average shrinks were for southwest Virginia 10.2 percent, Rockbridge County 9.39 percent, Augusta County 9.36 percent, and northern Virginia 7.79 percent. Shrink averaged 11.1 percent for lambs driven from 6 to 9 miles before loading and 12.4 percent for those driven from 17 to 25 miles. An increase of 10 hours in transit increased shrink 0.7 percent. Cripple and death losses for shipments in 1928-29 studied averaged 1 lamb crippled and 1 dead per 1,080 shipped. The correlation analysis showed the other factors studied to be relatively unimportant.

Marketing Indiana sweet potatoes, F. C. GAYLORD and H. M. CLEAVER (*Indiana Sta. Bul.* 370 (1933), pp. 24, figs. 14).—This is a study of the production factors as they affect quality, methods of storage, grading, standardization, and marketing. The data were obtained by personal interviews with growers, dealers, and transportation agencies. Yields, storage practices and losses, grading practices, destination of railroad and truck shipments, and prices are discussed with tables and charts showing the average yields of No. 1 and No. 2 sweetpotatoes, by counties 1929, 1930, and 1931; the average prices during the 1931-32 season for U.S. grades No. 1 and No. 2 and Indiana grades No. 1 and No. 2; destination, 1931-32, of No. 1 and No. 2 sweetpotatoes shipped by rail and by truck; comparison of farm prices of sweetpotatoes in 1920-31 in Indiana, New Jersey, Tennessee, and the average for Delaware, Maryland, and Virginia; the relation of average monthly car-lot shipments from Indiana, Maryland, Delaware, New Jersey, and Virginia, 1919-31, and of the average monthly car-lot shipments from Indiana, 1927-31, to the average monthly Indiana farm price of sweetpotatoes; the average, 1925-31, yields per acre of sweetpotatoes in Indiana and competing States; and the storage losses, 1931, from different causes in different Indiana counties. The leading markets for Indiana sweetpotatoes are discussed with data as to unloads, preferences, prices, and attitudes toward Indiana sweetpotatoes.

Some of the suggestions and recommendations made to growers are more attention to production factors, so that larger yields and a high percentage of No. 1 potatoes will be obtained, more rigid field grading and grading out of storage, better management of storage houses, use of U.S. grades and the Federal inspection service, and the use of some sort of a cooperative organization, with a sales agency, with a view to better regulation of truck sales and more uniformity in standardization and sales.

Marginal farm land in southern Indiana, G. E. YOUNG (*Indiana Sta. Bul.* 376 (1933), pp. 28, figs. 20).—The results of a detailed study of Gibson Township, Washington County, and a general study of 23 counties in the southern part of the State are reported. In the detailed study the township was divided into an agricultural area including 36 percent of the area and 81 operated farms, and a nonagricultural area including 34 operated farms. A survey record of the farm business of all farms was made in the fall of 1930. Land utilization was obtained from aerial photographs and data regarding taxes and assessments from county records. Tables, charts, and text compare the land use, the agricultural contributions, population, and resources of the two areas and also by averages per acre and per person, the farm receipts, expenses, and income, net taxable farm property, assessed valuation of land, current tax levy, and total delinquent taxes. The taxation problems resulting from the marginal land in the township are discussed.

Charts show for the 23 counties, by townships, the percentage of the area not in farms, 1929; percentage of farm acreage in harvested crops, 1929; average number of animal units, 1925-28, per 100 acres of land; value of farm land per acre, 1930; percentage of taxes delinquent, November 1, 1929;

assessed valuation per acre of land and improvements, 1929; tax rates, 1929; value of land and buildings per capita of farm population, 1930; acres of crops harvested per capita of farm population, 1929; school enumeration per \$10,000 taxable property; and State school aid, 1929, in percentages of assessed value of land and improvements. Using these 11 factors, a map is presented showing the 47 townships where marginal farm lands create acute economic problems. It is concluded that "State programs of education and legislative action directed toward bringing about reforestation and other better economic uses of land not adapted to farming seem warranted in these townships."

Farm or forest in the West Virginia Appalachians? A. J. DADISMAN (*West Virginia Sta. Circ. 65 (1933), pp. 12, figs. 7*).—This circular summarizes the more important facts and results in the bulletin previously noted (E.S.R., 67, p. 614).

An investigation of farm real estate values in Anderson County, South Carolina, B. A. RUSSELL (*South Carolina Sta. Circ. 50 (1933), pp. 16, figs. 3*).—This study of county records and farm management survey data had for its chief objectives an analysis of land prices and their trends during recent years and the relation of farm income to farmers' estimates of land value.

Tables and charts are included and discussed showing the relation of farm income to value of farm real estate (342 farms, 1914, 1924, and 1925); the yield and value per acre and price per pound of cotton and price per acre of farm land, by years 1900–32; the number of true consideration sales and price per acre of land, by years 1830–1932; the index of prices of Anderson County farm land, lint cotton in South Carolina, general price, and purchasing power of Anderson County farm land and South Carolina cotton, by years 1900–32; and comparison of farmers' estimates of land values and prices in recorded true sales, 1914, 1924, and 1925.

A direct relationship was found between the value of cotton and the value of land in the county, sometimes with a lag of only one or two years.

Louisiana farm taxes.—II, The general property tax and farm taxes, R. L. THOMPSON and B. W. ALLIN (*Louisiana Stas. Bul. 231, pt. 2 (1933), pp. 26*).—This is part 2 of the bulletin previously noted (E.S.R., 68, p. 402). The scope and regressive tendency of the general property tax are discussed, and the relation between property taxes on rural and urban properties and property incomes, between farm property taxes and family incomes from owner-operated farms, and between taxes and incomes of other groups are analyzed. Tables are included showing for 1928, 1929, and 1930 the gross rent, expenses other than taxes, taxes, and ratios of taxes to gross and net rents for 81 rented farms and 51 rented urban properties; the total and average farm cash income, gross and net, and cash expenses by items for 1,519 farms in 1930; the average incomes, taxes, and ratio of taxes to net incomes of individuals in Louisiana filing Federal income returns in 1928 and 1930 by net income classes; the net incomes, taxes, and ratio of taxes to net incomes of 140 professional people in 1928, 1929, and 1930; and the ratios of assessed value to selling value of rural and urban real estate, 1925–30, by different selling value classes and by selling value per acre for rural real estate.

Taxes took 37.4, 52.9, and 71.2 percent, respectively, of the net rent in 1928, 1929, and 1930 of the 81 rented farms, and 36.1, 35.7, and 59 percent, respectively, for the 51 rented urban properties. For the 1,519 owner-operated farms, taxes in 1930 absorbed 47 percent of the net cash income before deducting taxes and 13 percent of the family net income from all sources. Direct taxes paid in 1930 by individuals in the State who reported to the Federal Government net incomes of over \$5,000 averaged 5.7 percent of their net incomes.

The ratios of assessed value to selling value per acre of farm lands, 1925-30, were 71.4 and 53.9 percent, respectively, for lands selling from 0 to \$20 and from \$21 to \$40 per acre, as compared with 51 percent for all lands studied in selected parishes. For sales amounting to from 0 to \$500, the ratio was 77.1 percent and for sales of from \$501 to \$1,000, 54.6 percent. For urban real estate the ratios were 95.6 percent for property selling from 0 to \$500, 74 percent for that selling from \$501 to \$1,000, and 64.6 percent for that selling from \$1,001 to \$1,500, as compared with 61.4 percent for all properties studied.

RURAL SOCIOLOGY

Local group organization among Illinois farm people, D. E. LINDSTROM (*Illinois Sta. Bul. 392 (1933), pp. 125-176, figs. 22*).—The number and variety of local organizations found active among the farm people of Illinois bear evidence of a felt need for something more than individual action in developing satisfactory economic, social, and cultural conditions in rural communities. Some form of local organization was found in a majority of the rural communities of the State. The author endeavored to determine whether such organizations were adequate in kind and extent and whether they were functioning effectively. Approximately 500 farm men and women, officers or members of local organizations or active in community affairs, were interviewed either personally or in August 1930 by questionnaire. Usable data concerning the opinions of 433 farm people living in 306 localities in 60 counties of Illinois were obtained. Of these 433 farm people, some 284 indicated membership in a rural organization, while others had been members at some previous time.

The evidence showed that the farm people of Illinois believed in local farm family organization to further their educational, social, cultural, and economic interests. Sixty-four percent of the people submitting data expressed the opinion that farm family groups should, ideally, give special emphasis to educational purposes. Of actual rural organizations studied, nearly half were really organized to serve educational purposes particularly, and changes in purpose had been more in favor of educational activities than other activities.

Farm bureau units, parent-teacher associations, community clubs, home bureau units, granges, community units, and farmers' clubs were the types of groups most prevalent in the State. Fifty percent of all the groups studied were 5 or more years old, 30 percent 10 or more years old, and 5 percent 20 or more years old. Membership or attendance was drawn from areas ranging in size from the area of a school district to approximately 45 or 50 sq. miles. Homes and school houses were the most popular meeting places.

Seventy-seven percent of all groups gave all members the opportunity to take part in group activities. Organizations were financed by dues, special collections, refreshment sales, subscriptions, and admission to special functions. The functions most often reported by local groups were the development of interest in farm organizations, stimulation of group spirit, procuring and disseminating outside information, improvement of acquaintanceship, group performance of work of an occupational character, and satisfying social and recreational wants. Although there had been many changes in group purposes and practices, the general opinion of both members and nonmembers was that more group purposes and practices were necessary. The implication was that most rural organizations of the types studied existed on a stable basis.

Some principles for the successful organization and conduct of local groups of farm people are set forth, as well as the questions submitted.

The human factor in the management of Indiana farms, W. W. WILCOX and O. G. LLOYD (*Indiana Sta. Bul.* 369 (1932), pp. 23, figs. 6).—The chief objective of the authors was to analyze the personal history and characteristics of a number of farm owners to determine the factors responsible for differences in financial achievement. The report deals with a statistical analysis of personal factors correlated with labor income and with three groups of farmers representing three distinct levels of success.

When variations in personal factors were related to the average labor income of 183 Indiana farmers in 1929 and 1930, the range in labor income was from \$3,422 for the highest man to minus \$1,846 for the lowest. Personal factors most closely related to variations in labor income are aid and encouragement from wives, ambition to make economic progress, interest in farming as an occupation, and agricultural information. The better quality farms were operated by men ranking higher in these personal factors. Men who inherited the most property had lowest labor incomes. Younger men, many of them renters, had higher incomes than older men owning the most property.

After making deductions for inheritance of property, master farmers averaged a net accumulation of 107 acres; 20 typical farmers, 59 acres; and the least successful group, 7 acres of land. Master farmers inherited less property than the typical farmers, raised more legumes, handled hogs more efficiently, had fewer children of helping age, and received more help and stimulation from their wives than men of the other groups. Master farmers also were less easily satisfied, knew more about their business, were more interested in it, showed more ability in their farm plans than the other groups, and devoted some of their time and energy to a solution of community problems.

Connecticut rural youth and farming occupations, J. L. HYPES, V. A. RAPPORT, and E. M. KENNEDY (*Connecticut Storrs Sta. Bul.* 182 (1932), pp. 48, figs. 9).—The study reported aims to answer the question for Connecticut: What becomes of the children of rural families when they reach working age? It is a segment of a broader study (E.S.R., 63, p. 184) of the mobility of the population of rural Connecticut. The data were collected in the fall and winter of 1929 by means of a house-to-house survey of 616 rural families in 6 towns selected because of type of farming, nearness to the city, and other factors.

Following are some of the conclusions drawn: Human social behavior is not chaotic and unpredictable but complies with laws which may be discovered and described. Both similarities and dissimilarities in the social behavior of the diverse population elements in Connecticut rural towns were noted and, so far as possible, explained. A slackening interest in farming on the part of Connecticut youths was found. While 71 percent of the fathers interviewed were farming, only 31 percent of the sons 16 years of age and older were farming. This conclusion is supported by the fact that the number of farms in the State had decreased 24.1 percent in the decade ending in 1930. Sons engaged in nonfarming pursuits were distributed over 70 or more different occupations, and the daughters engaged in nonfarming pursuits were distributed over some 25 different occupations. While only 31 percent of the sons were engaged in farming and only 7 percent of the daughters were engaged in farming or had married farmers, those who did enter farming were, very largely, children of fathers who were employed full time in farming.

Relatively few sons of part-time farmers, farm hands, or nonfarmers entered farming as a vocation, and "evidently farm experience on the part of fathers is a necessary condition in Connecticut for an appreciable number of sons to elect farming as a vocation." There appeared to be little or no pronounced relation between the national origins of fathers and the disposition of sons and daugh-

ters to enter farming as a vocation. Though there appeared to be a slight, but significant, relation between the type of farm home and the disposition of sons to enter farming, it was obvious that no type of farming can be regarded as a very vigorous vocational recruiting station for the agriculture of the State. A majority of sons who entered farming came from home farms having very small businesses. A rather marked relation between the quality of home equipment for the promotion of health, convenience, and comfort and the selection of agriculture as a vocation by the sons was found. The homes having the highest score (91 to 100) had 29 sons entering farming as a vocation, the largest number of any of the 10 intervals in the score of homes. Conversely, the homes scoring lowest sent next to the fewest sons into farming.

[Influence of children on farmers' standard of living], E. L. KIRKPATRICK, P. E. McNALL, and M. L. COWLES (*Wisconsin Sta. Bul.* 425 (1933), pp. 50-53).—This is a study of 900 farm families representing the six major farm-type areas of Wisconsin.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Studies in taxation: Financing education in Delaware, M. M. DAUGHERTY (*Delaware Sta. Bul.* 182 (1932), pp. 126, figs. 25).—"It is the purpose of this treatise to examine the expenditures of public funds for education, so that the public may be informed of sources of receipts and purposes of expenditures over a long enough period of time to enable it to form an intelligent opinion of the problem."

Chapter 1 (pp. 11-61) traces the financing of current expenditures and expenditures for permanent improvements from Colonial days to the present, and discusses the present methods and the present distribution of support between local and State sources. Chapter 2 (pp. 62-80) discusses the construction of an index number for the rating of State school systems, the index being based on the following factors: Average number of days school attended per year per child of school age not attending a private or parochial school; holding power, or the evenness of distribution of the children through the grades; value of school buildings per child unit enrolled; number of elementary pupils per teacher; number of high school pupils per high school teacher; and average annual salaries of teachers, principals, and supervisors. A table shows the indexes for and rank of the several States in the United States each two years, 1918-30. The advantages and disadvantages of such index numbers and the influences of density of population and racial composition of the population on the Delaware indexes are discussed. Chapter 3 (pp. 81-90) discusses the sources of income of the school funds of the State and outlines two procedures that could be used to build up reserves to insure future school funds. Chapter 4 (pp. 91-98) traces the history of the financing of higher education in the State. Chapter 5 (pp. 99-121) deals with the changing concepts of justification of public participation in education. It includes short discussions of the religion, political, and economic theories of education. The economic theory is illustrated, and a State system of college scholarships for worthy individuals is proposed.

FOODS—HUMAN NUTRITION

Food in health and disease, K. M. THOMA (*Philadelphia: F. A. Davis Co.*, 1933, pp. 370).—The subject matter of this text and laboratory manual for student nurses and dietitians is based upon the lectures and class work at Michael Reese Hospital, Chicago, where for the past five years the principle

that the therapeutic diet is simply the normal diet modified to meet special conditions existing in certain diseases has been followed both in student training and in practice in the service of food to the patients. This emphasis upon the normal diet as the basis for therapeutic diets is brought out particularly in the section on diet in disease, the final chapter of which summarizes diets for various pathological conditions in the form of breakfast, dinner, and supper menus as variations of a full diet.

The trend of recent advances in the chemistry of food and nutrition, H. C. SHERMAN (*Jour. Amer. Dietet. Assoc.*, 8 (1933), No. 5, pp. 373-381).—In this paper, presented at the 1932 meeting of the American Dietetic Association, the author calls special attention to the striking interrelation between energy and protein metabolism in that amino acids function not only as building stones for the construction of body tissues, but as precursors of catalysts for adjusting the rate of chemical processes within the body to nutritional needs; to the individuality of the various vitamins, each of which is considered to present a separate problem to be studied upon its own merits; and to the greater need of care in providing for calcium than iron in the diet of growing children. Recent advances in the knowledge of the vitamins is summarized briefly. In the author's opinion vitamins A, C, and G occupy a position of growing importance, vitamin B is of less importance, and vitamin D has been overemphasized as compared with calcium.

Index to the literature of food investigation, compiled by A. E. GLENNIE ([*Gt. Brit.*] *Dept. Sci. and Indus. Res., Index Lit. Food Invest.*, 4 (1932), No. 1, pp. IV+135).—This issue of the semiannual publication noted previously (*E.S.R.*, 64, p. 578) contains a summary of noteworthy developments during 1930-31 in methods of food preservation, followed by brief abstracts of the literature classified as in previous publications.

[Nutrition studies at the New York State College of Home Economics] (*N.Y. State Col. Home Econ., Cornell Univ., Ann. Rpt.*, 7 (1932), pp. 21-24).—This progress report includes brief summaries of studies by M. Henry and N. L. B. Morey on habits of food selection and certain aspects of health, by H. Monsch and A. Lautz on the comparative digestion by pepsin in vitro of artificial infant foods, by Monsch and M. Harper on problems in infant nutrition, by Monsch and R. Sanders on practices in infant feeding and the physical development of infants, and by M. Pfund and L. Catherwood on the culinary qualities of different varieties of New York apples.

[Food and nutrition studies in Wisconsin] (*Wisconsin Sta. Bul.* 425 (1933), pp. 6, 9, 10, 11, 12, 15, 16, fig. 1).—In this progress report (*E.S.R.*, 67, p. 769) are brief summaries of studies by H. Steenbock and V. Templin on the development and destruction of the anticalcifying factor in field and sweet corn (p. 6); by C. A. Elvehjem, E. B. Hart, and W. C. Sherman on the availability of iron in cereal grains (pp. 9, 10); by D. R. Mendenhall, Elvehjem, and W. H. Peterson on the hemoglobin content of the blood of healthy infants, with attempts to check the rapid fall in hemoglobin during the first weeks of life (pp. 11, 12); by H. Parsons on the loss of vitamin A in thick butter cookies on baking (p. 15); and of a continuation of the studies of D. Turner on the effect of ingestion of dried prunes and commercially canned plums on the reaction of the urine (p. 15); and of Parsons, E. Kelly, and J. Lease on the pellagra-like disorder occurring in rats on diets containing a high percentage of raw egg white (p. 16).

Fruits and vegetables, W. H. EDDY ET AL. (*Amer. Pub. Health Assoc. Year Book*, 1932-33, pp. 71-73).—This summary of recent research includes data contributed by C. R. Fellers on the vitamin C content of cranberries (*E.S.R.*,

69, p. 142) and strawberries, a brief summary of types of current research on fruits and vegetables, and a discussion of the various ways in which they contribute to the preservation of health.

Chemical composition and food value of the avocado, *Persea americana* of Miller, C. M. ALBIZZATI (*La palta, avocado o aguacate "Persea Americana" de Miller: Composición química y su valor alimenticio. La Plata: Govt., 1932, pp. 10, pls. 6*).—Data are reported on the composition of avocados grown in the Province of Jujuy, Argentina. The varieties tested were Trapp, Guatemala, Pollock, Blakeman, Enerte, and Lula, and the data include weights of various structural parts of the fruit, proximate analyses, percentages of the constituents of the edible portion on the dry basis, physical and chemical constants of the fat, calorie values of the edible portion, and nutritive values in terms of starch. Preliminary data are given on the average content of phosphorus and calcium in the ash of the fruit.

Preserving Florida citrus fruits, I. S. THURSBY (*Fla. Univ. Agr. Ext. Bul. 75 (1933), pp. 28, figs. 2*).—Following brief descriptions of the various citrus fruits grown in Florida and general suggestions as to the best means of preserving the different types, recipes and directions are given for the preparation of citrus preserves, marmalades, jellies, and butters and for crystallizing citrus fruits, curing and preserving citron, canning grapefruit, and bottling grapefruit juice, orange juice, and fruit punch.

The effect of fat on shrinkage and speed in the roasting of beef, M. THILLE, L. J. WILLIAMSON, and A. F. MORGAN (*Jour. Home Econ., 24 (1932), No. 8, pp. 720-733, figs. 4*).—In the investigation reported, the rate of heat penetration into beef fat was first observed by inserting thermometers into balls of the fat weighing about 890 g and noting the rise in temperature when the fat was left in the oven at 230° C. As the fat softened the rate of heat conduction increased, becoming much more rapid after the temperature had reached the melting point of the fat. These findings were interpreted as indicating that in a roast surface fat increases and internal fat decreases the rate of heating. It is noted, however, that the fat in the surface layer of a roast might not offer the same rate of heat conduction as that of a globular mass of suet. Experiments on the rate of rendering of fat from 100-g spherical masses of beef suet showed that this fat is removed at a remarkably uniform rate.

In the roasting experiments proper, 3-rib roasts from 3- to 4-year-old animals were cooked as standing roasts in well-insulated ovens at an initial temperature of 225°, which dropped in a few minutes to 210°. This temperature was maintained until the thermometer in the center of the rib-eye of the roast registered 65°. The roasts were then removed from the oven and further increases in internal temperature noted. At the end of from 16 to 18 hours the total loss of weight, the weight of the drippings and of the rendered fat, and the condition of the interior of the meat were noted. The data are reported in two groups, (1) roasts having thick surface fat either natural or added and (2) those having either no fat cover or a very thin natural layer.

The data include the speed of cooking and losses for 10 roasts in each group, the effect of skewers upon the speed of roasting for 6 roasts in the first and 2 in the second group, shrinkage in size of 11 roasts in the first and 10 in the second, and the change in water and fat distribution in the meat of 6 roasts in the first and 9 in the second group. The general conclusions are essentially as follows:

External fat increases and internal fat may decrease the rate of heat penetration into roasts. The total cooking losses of fat roasts are greater than of lean roasts due to the rendering out of surface fat, but volatile losses are less.

The shrinkage of fat roasts is less than of lean. The drying of the centers of roasts on cooking is less in fat-covered than in lean roasts. "In the fat-covered roasts the fat content of the centers of the cooked meat is less than that of the surfaces but greater than that of the raw centers. This increase is the natural result of the melting and penetration of surface fat. In the lean-surfaced roasts the fat content of the cooked centers is greater than that of the raw centers, but greater or less than that of the cooked surfaces in accordance with the placing and amount of interior fat."

A decade and a half of soft-curd milk studies, R. L. HILL (*Utah Sta. Circ.* 101 (1933), pp. 16, fig. 1).—This circular, which supplements but does not supersede Bulletin 227 (E.S.R., 65, p. 689), describes a modification of the original instrument for determining the softness of the curd of milk, with directions for conducting the test with the new instrument, and summarizes the results of investigations reported from the station and elsewhere since June 1931 on the distribution of soft-curd character in dairy breeds and in goats in comparison with cows; the effects of pasteurization, boiling, evaporation, and homogenization on curd character in milk; the effects of feed, lactation, external weather conditions, and chemical composition of the milk on the hardness of the curd; and the normality of soft-curd milk, its digestibility and practical value in infant feeding. The geographical distribution of soft-curd milk studies and the use of the Hill curd test in the manufacture of cheese are also noted, and an extensive list of literature references is appended.

Muffins and cakes without wheat, A. M. FIELD, B. GOLD, and H. LUNDGREN (*Jour. Amer. Dietet. Assoc.*, 8 (1932), No. 3, pp. 262-267).—Recipes and directions are given for making satisfactory muffins containing neither wheat nor eggs.

Freshly ground entire grain rice, rye, or barley flour, used separately, made satisfactory, lima bean and soybean flour less desirable, and buckwheat flour unsatisfactory products. The omission of eggs led to improved flavor in muffins made with the stronger flavored flours such as buckwheat, lima bean, and soybean. The rice, rye, and bean flours required more cooking than bolted wheat flour. In weight for weight substitutions of the flour, the liquid should be increased with rice and rye and decreased with buckwheat. Sponge cakes made from standard recipes, using rice and barley flours, scored higher than those made from wheat and were satisfactory with the other flours. In all except rice flour no alteration was necessary in the recipe. Rice flour cake was improved by decreasing the flour and sugar slightly.

The national cookbook, S. HIBBEN (*New York and London: Harper & Bros.*, 1932, pp. XXI+452).—The usefulness of this volume of tested recipes from all sections of the country is enhanced by a regional as well as a general index.

Diet and its effect upon blood formation, F. S. ROBSCHUIT-ROBBINS (*Jour. Amer. Dietet. Assoc.*, 8 (1933), No. 5, pp. 387-395).—This is a concise review of the extensive investigations of the author, with Whipple and others, on the diet factors promoting blood regeneration in dogs rendered anemic by repeated bleedings (E.S.R., 63, p. 896).

Studies in the food requirement of adolescent girls, I-III, B. WAIT and L. J. ROBERTS (*Jour. Amer. Dietet. Assoc.*, 8 (1932), Nos. 3, pp. 209-237, figs. 8; 4, pp. 323-331, fig. 1; 8 (1933), No. 5, pp. 403-422, figs. 6).—This report is presented in three papers as follows:

I. *The energy intake of well-nourished girls 10 to 16 years of age* (pp. 209-237).—The energy intakes of 52 well-nourished school girls from 10 to 17 years of age, a few living in their own homes and the rest in institutions, were deter-

mined for a period of one week. In all cases accurate records of all food eaten were kept during the week, and the values were determined by calculation, using tables of average composition of raw foods, or by burning composite samples in the oxycalorimeter.

The average daily intakes for the individual subjects varied widely, from 1,649 to 2,925 calories. No close relation could be established between these variations and any single measure of development—age, weight, or height. The curve of mean intakes by age was slightly above the standard for the earlier years, but markedly below Holt's and somewhat below Hawley's curves. Of the various prediction standards, that of Hawley (E.S.R., 58, p. 84) is suggested as the best to use tentatively until more data are available. Of the single measures, height is considered the most reliable, with a rough allowance of about 16 calories per centimeter (40 per inch).

Of combined measurements, calories per kilogram per age or per kilogram per centimeter of height gave better predictions than per centimeter per age or any single item. Of the two, calories per kilogram per age is recommended as in common usage and a smoothed curve dropping about 5 calories per year from 10 to 16 years is suggested as a convenient tentative standard.

When the subjects were grouped according to their physiological development into five so-called physiological age groups, it was found that calories per kilogram decreased with physiological age, while calories per centimeter remained quite constant until past the period of rapid growth.

II. *Daily variations in the energy intake of the individual* (pp. 323-331).—The daily energy intakes from which the averages used in the previous report were obtained have been subjected to scrutiny with reference to regularity in food habits and to the length of time such studies should be carried on to give an accurate picture of the food consumption of children on freely chosen diets.

The least difference from day to day in the calorie intake of any of the 52 subjects was 256 calories, representing 10 percent of the minimum intake of the subject, the greatest 2,006, or 180.7 percent, and the average variation for the whole group, 894 calories, or 49 percent. No satisfactory explanation has been found for these variations. The greatest spread from maximum to minimum intake came in the thirteenth and fourteenth years when the average intake was highest and growth most rapid. Among the factors suggested as possibly playing a part are food likes and dislikes, differences in bulk, and the influence of one day's food on the next.

A study of all possible combinations of four consecutive days for 10 of the subjects showed that in only 65 percent of the combinations the intakes varied from the week's average by less than 5 percent and in some cases the variations were as much as from 10 to 13 percent from the week's average. It is concluded that a week is to be preferred over shorter periods, and that observations over still longer periods will be necessary to determine whether or not a week is a long enough unit for reliable results.

III. *The protein intake of well-nourished girls 10 to 16 years of age* (pp. 403-422).—The protein intakes of the 52 subjects were determined in various ways. The protein content of six diets was determined by actual nitrogen analyses of composite samples and that of the cooked foods and food mixtures of four other diets by analysis except for foods known to contain a negligible amount of protein, with calculations of the protein content of the raw foods. The protein values of the diets of the girls living in institutions were for the most part calculated, with actual analyses of a few foods for which only incomplete data could be obtained.

As was the case with total energy, there was a wide range in protein intake, from 51.4 to 97.1 g per day, with a fairly even distribution over this range. No close relation was found between the total protein and age, weight, or height taken separately. The coefficients of correlation in all cases were too low to warrant the use of any one of the three relationships as a single method of prediction. The relationships were higher for protein per kilogram per age and per kilogram per centimeter of height, with the coefficient of correlation slightly higher for the latter. The difference was not statistically significant and the former is recommended as having some advantage in practical use. "On this basis the girls of this study averaged roughly 2 g per kilogram at 10 and 11 years, 1.5 g from 12 to 15 years, and 1.2 g at 16 and 17 years. Supported also in the literature by data from normal children, on both balances and intakes, the writers are inclined to accept these values as tentative minimum standards for 'good practice' until the requirements are more accurately determined by balance experiments."

A close correlation was shown between protein and energy intakes. An average of 12.4 percent of the calories came from protein. "The common practice of providing 10 to 15 percent of the calories in the form of protein is therefore justified by this study. The simplicity of this method suggests its practical use, especially in providing for groups, when it is assured that ample calories are being consumed and when there is no necessity for restricting protein to bare requirements."

Each of the three papers contains an extensive review of the literature on the subject.

Feeding the family in an emergency, L. H. GILLET (*Jour. Amer. Dietet. Assoc.*, 8 (1933), No. 5, pp. 382-386).—Practical suggestions are given for food selection and distribution in emergency relief work. In the author's opinion the most desirable method of administering relief is to provide the families with cash and teach them to select proper foods. Since this requires education and is impractical in times of emergency, an alternate method is suggested in which the needs of families of various sizes are estimated in terms of food orders, the costs of which are calculated at local prices. Families applying for aid are then given a money order on a local store and make their own selection. It is recommended that with the money order should go a sheet suggesting the number of quarts of milk and pounds of bread, cereals, and vegetables the family should buy before purchasing eggs, meat, fish, fats, or sweets. It is considered essential to provide cod-liver oil for every child under 2 or 3 years of age. "Since this cannot be purchased on a food order, and since unemployed families cannot purchase it for themselves, many welfare agencies buy it at wholesale rates and dispense it to families in which there are small or malnourished children or nursing and pregnant women."

Quality studies of therapeutic diets.—III, The reduction diet, E. HAYWARD and D. S. WALLER (*Jour. Amer. Dietet. Assoc.*, 8 (1932), No. 3, pp. 256-261).—In this continuation of the quality studies of therapeutic diets (*E.S.R.*, 69, p 763), information on diet recommendations for obesity was obtained in two ways: (1) Replies to questionnaires sent to physicians interested in obesity and its correction and (2) calculated menus contributed by hospitals.

The general recommendations indicated in the replies to questionnaires include a range in calories from 600 to 1,700, with a mean of 1,200 calories and of protein from 1 to 2.5 g per kilogram of body weight; calcium, phosphorus, and iron at least equaling normal requirements; a liberal intake of vitamin-containing foods; and a diet of high residue.

The menus submitted were recalculated to comparable weights of serving portions and tabulated for ranges of nutritive values grouped as 1,000 calorie diets from western hospitals and 600 to 1,000, 1,000 to 1,250, and 1,250 to 1,500 calorie diets from eastern hospitals. The protein minimum for the lowest calorie diet was close to the Sherman minimum of 44 g per 70 kg of body weight. The iron values were also close to the minimum. Calcium and phosphorus ranged from barely adequate to seriously inadequate. The diets were all high in fiber, were predominantly basic in reaction, and probably furnished adequate amounts of vitamin B (complex) and C and a fair amount of A.

Recommendations for improving these diets are given in the form of a diet of 1,200 calories, the nutritional adequacy of which is thought to be assured by the daily inclusion of 1 pt. of milk, 6 servings of vegetables and fruit, 1 serving of lean meat, and 1 of eggs and not less than $\frac{1}{2}$ oz. of butter.

Significance of studies of ketosis and of nitrogen and water balance to obesity diets, J. I. ROWNTREE (*Jour. Amer. Dietet. Assoc.*, 8 (1932), No. 4, pp. 307-315).—A critical review of the literature on the effects of ketosis, protein loss accompanying dietary restriction, and the relation of weight loss to water retention is reported, with the conclusion that "the most undesirable result of ketosis is increased nitrogen loss on account of the break-down of protein for its ketolytic action, that obese subjects are less susceptible to ketosis than subjects of normal weight, that adequate base in the diet tends to reduce the nitrogen loss on restricted diets, and that procedures which shift the balance toward the acid side favor the loss of water from the tissues."

Is fluorine an indispensable element in the diet? G. R. SHARPLESS and E. V. MCCOLLUM (*Jour. Nutrition*, 6 (1933), No. 2, pp. 163-178, fig. 1).—In attempting to answer this question, a modified method for the colorimetric determination of fluorine was developed by a combination of the volatilization procedures of Reynolds, Ross, and Jacob (*E.S.R.*, 59, p. 503) and of Wagner and Ross (*E.S.R.*, 38, p. 313) with the colorimetric method of Merwin and Stieger. The procedure was based upon the formation and volatilization of silicon tetrafluoride when the substance to be analyzed is intimately mixed with fine silica and decomposed with H_2SO_4 , and the colorimetric method upon the bleaching action of fluorine on the yellow color of an oxidized titanium solution. The technic is described in detail.

A diet was prepared as free as possible from fluorine and fed to 10 rats, while 6 others were fed the same diet with 0.001 percent fluorine. The animals were 35 days of age at the beginning of the experiment, which was continued into the third generation. When the animals were sacrificed, calcium and phosphorus determinations were made of the bones and fluorine determinations of the teeth and bones.

Growth and reproduction were normal on the low fluorine diet, and no abnormalities which could be attributed to low protein were evident. Considerable trouble was experienced in getting the young to live, but as this was also true of the control rats receiving fluorine, the difficulty could not be attributed to lack of fluorine.

The fluorine content of the teeth and bones increased with increased content of fluorine in the diet. No fluorine could be detected in the teeth of the animals on the low fluorine diet. The teeth were of normal structure and showed no evidence of caries. There was slight indication of hemorrhages and a proliferation of capillaries in the bone just outside the outer enamel epithelium. There was no change in the calcium-phosphorus ratio of the bones.

The biological values of proteins, III, IV, M. A. BOAS FIXSEN and H. M. JACKSON (*Biochem. Jour.*, 26 (1932), No. 6, pp. 1919-1933).—In continuation

of the investigation noted previously (E.S.R., 65, p. 586), two papers are presented.

III. *A further note on the method used to measure the nitrogenous exchange of rats* (pp. 1919-1922).—"Certain modifications are described in the method used to estimate the biological values of proteins from the results of measurements of the nitrogenous exchange. These are concerned with securing an adequate and uniform intake of calories and with obtaining a satisfactory estimate of the basal nitrogen metabolism."

IV. *The biological values of the proteins of wheat, maize, and milk* (pp. 1923-1933).—Following a brief discussion of different methods employed and conflicting data obtained in studies on the relative biological values of the proteins of different foodstuffs, including the work of McCollum and associates (E.S.R., 46, p. 161), Thomas (E.S.R., 28, p. 68), Wilson (E.S.R., 46, p. 762), and Mitchell and associates (E.S.R., 57, p. 90), data obtained by the authors' method are reported on the biological values of the proteins of various foodstuffs. The averages with the protein fed at a 7 percent level unless otherwise stated were as follows: Whole wheat (6 percent) 68, wheat germ 69, wheat endosperm 61, whole corn (8 percent) 67, (5 percent) 84, corn endosperm 70, whole milk 86, lactalbumin 65, casein (6 percent) 76, and heated casein 54.

The similarity between the biological values of the proteins of wheat and corn is thought to afford no support to the theory that pellagra among corn eaters is the result of simple amino acid deficiency. "So far no satisfactory explanation is forthcoming of the general experience of mankind that diets consisting largely of maize have been found of inferior nutritive value to these containing wheat as the principal foodstuff."

The influence of foodstuffs on the rate of urinary acid excretion, C. E. BRUNTON (*Jour. Physiol.*, 78 (1933), No. 1, pp. 65-79, figs. 15).—In this investigation of the effect of various articles of diet on the acidity of the urine, four healthy trained subjects took a standard breakfast at 8 a.m. and the substance to be tested at noon or a little later when, according to Dodds (E.S.R., 49, p. 560), there is an acid tide in the urine. Urinary samples were taken half hourly before and for at least 2½ hours after the meal and titrated with phenolphthalein as indicator. The data obtained are presented as curves showing the amounts of titratable acid in the urine passed per minute.

Of the foods tested, banana in amounts of 255 g, potato 335, and lima beans 250 g caused a decreased output of acid during the period in which, if no food was taken, the subject's output of acid rose. Raisins (200 g) caused an increased output of acid, and prunes (200 to 290 g) a small but definite increase. Boiled rice (50 g of dry rice), whole wheat bread (140 g plus 210 cc of water), grapefruit pulp and juice (235 and 294 g), and meat (65 g) were without appreciable effect. A combination of meat and bread caused a slight decrease, and of meat and potato a greater decrease, in the acid output of the subject who had previously taken meat alone. A combination of potatoes and prunes gave identical results with those obtained in the same subject on prunes alone.

Attention is called to discrepancies in some of these findings with the alkalinity of the ash of the same foods as reported earlier by Sherman and Gettler (E.S.R., 26, p. 158). "The discrepancy is partly due to the fact that the acid salts of dibasic organic acids were not measured in Sherman and Gettler's analyses. Some of these are oxidized in the body, leaving alkali behind for excretion. Others are excreted as acids by the kidney." Other factors influencing the action of the various foodstuffs are discussed.

The physiological effects of radiant energy, H. LAURENS (*New York: Chem. Cat. Co., 1933, pp. 610, figs. 104*).—This volume, which is one of the American Chemical Society monograph series, reviews in considerable detail the great mass of literature dealing with laboratory studies and clinical investigations on the physiological effects of radiant energy. Of particular interest are the five chapters, constituting more than one third of the entire text, devoted to the effects of radiant energy on metabolism and the final chapter on the mode of action of radiant energy on physiological and pathological processes. An extensive bibliography, referred to throughout the text, is appended.

On being poisoned by harmless foods, so-called food atopy, J. FORMAN (*Jour. Amer. Dietet. Assoc., 8 (1932), No. 4, pp. 316-322*).—Atopy is defined in this paper as the special form of allergy or altered reactivity to certain foodstuffs which is controlled by inheritance. A brief discussion, with explanatory chart, is given of the diagnosis of the condition, the various forms in which it may be manifested, and the identification of the offending food by skin tests and elimination diets. Asthma, hay fever, hives, migraine, and mucous colitis are considered to be atopic in nature.

"The best means of treating an atopic individual who has been found to be specifically sensitive to an avoidable food is to remove the excitant from his diet. When this can be accomplished, attempts to increase his tolerance to this offender are superfluous. In some instances it is practically impossible for the patient to avoid the excitant, and in such cases the procedure for increasing the tolerance of the patient to the offending food may be tried."

Some problems of Salmonella food poisoning, W. G. SAVAGE (*Jour. Prev. Med., 6 (1932), No. 6, pp. 425-451, figs. 2*).—In this Sedgwick Memorial Lecture for 1932, the author discusses various aspects of *Salmonella* food poisoning from knowledge gained through the series of investigations by Savage and White (*E.S.R., 55, p. 92*) and detailed studies of outbreaks officially reported in England since the earlier investigation. The main topics discussed are the prevalence of *Salmonella* food poisoning, specialization of the *Salmonella* group as regards animal hosts, sources and paths of infection, and food poisoning outbreaks due to toxic bacterial products.

The vitamins in health and disease, B. SURE (*New York and London: Century Co., 1933, pp. XIV+206*).—This small volume, which contains a foreword by W. H. Eddy, has been written to supply the need of a simple, non-technical text on the vitamins, with special emphasis on human relations and applications. Following a brief historical chapter, each of the universally recognized vitamins A, B (B_1), C, D, E, and G (B_2) is discussed in a separate chapter, the treatment varying with the vitamin in question but with emphasis throughout on clinical applications. To illustrate, special attention is given to the relation of the deficiency of vitamin A to infection, vitamin B to infant malnutrition and mortality, vitamin C to dental caries (with discussion of opposing views), vitamin D to rickets, and vitamin G to pellagra.

The two final chapters deal, respectively, with the vitamin content of foodstuffs and the role of vitamins in health and disease. In the former the contributions of various classes of foods to the vitamin content of the diet are discussed briefly, with the conclusion that "if we consume daily 1 to 2 pt. of milk, at least 1 egg, one third to one half glass of orange or tomato juice, a generous portion of vegetables, fresh or canned, whole cereals for breakfast two or three times weekly, meat at the noon or evening meal, introducing liver, kidney, heart, or sweetbreads at least once weekly, we need have little fear of

vitamin deficiencies." In the closing chapter chief emphasis is given in the section devoted to vitamins in health to the provision of vitamins during the nursing period, in pregnancy, and in infant nutrition; and in vitamins in disease, to the relation of vitamin deficiencies to infection, vitamins in the cure of ulcers of the stomach and intestines, celiac disease, epilepsy and pellagra, and diseases of the heart and nervous system.

[**Vitamin investigations**] (*Idaho Sta. Bul.* 197 (1933), pp. 40-43).—In this progress report (E.S.R., 68, p. 414) the results are summarized of a four-year investigation of the vitamin C content of the Idaho Russet Burbank potato, commonly known as Netted Gem, in various stages of maturity and storage. Progress is also noted on studies of the vitamin G content of potatoes and the vitamin A content of various pasture grasses.

The vitamin content of cereals, F. C. BLANCK ET AL. (*Amer. Pub. Health Assoc. Year Book*, 1932-33, pp. 54-57).—This annual report (1932) of the committee on cereals and their products of the food and nutrition section of the American Public Health Association summarizes briefly the literature on the content of vitamins in the common cereal grains, with the conclusion that "the vitamin content of cereals is a minor factor of their outstanding importance as food. The two significant facts are the high vitamin E content of wheat embryo and the relatively high vitamin A and carotene content of yellow corn."

The effect of storage and canning upon the vitamin content of carrots, D. D. LANGLEY, J. E. RICHARDSON, and E. J. ANDES (*Montana Sta. Bul.* 276 (1933), pp. 32, figs. 9).—Chantenay carrots grown for 3 successive years on irrigated land at an altitude of 4,800 ft. were used for the study, which included the effect of storage in sand in a cool damp cellar (temperature from 38° to 54.1° F., relative humidity from 77 to 96 percent) and in a warm dry cellar (temperature from 52.5° to 62.6°, relative humidity 47 to 59 percent) and of cooking and canning (by the pressure cooker and oven methods) on the palatability and content of vitamins A, B₁, and C.

For feeding in the raw condition the carrots were washed, scraped as for table use, and cut carefully in cross sections to insure distribution of the flesh and core. For feeding in the cooked state the scraped carrots were cut into approximately 1-in. cubes, dropped into unsalted boiling water, and cooked vigorously for 25 minutes and then drained, allowed to cool, and cut crosswise in thin sections.

In the vitamin A tests (rats), the smallest amount fed was 0.25 g daily. On this dosage the gains in weight for the 8 weeks' period were far in excess of unit gains by the Sherman method, but there was slight or very slight evidence of secondary infection. Equivalent amounts of the raw samples, fresh or stored by either method, and of the cooked samples gave practically equivalent weight gains, leading the authors to conclude that "carrots may, therefore, be considered a very dependable source of vitamin A, whether used when fresh from the garden or after being stored for several months in either cool or warm storerooms. Neither does cooking impair the effectiveness of this vitamin, but rather seems to slightly increase its growth-promoting potency after the vegetables have been stored.

In the vitamin B₁ tests (rats) 2.5 g, the smallest dose fed, afforded complete protection against polyneuritis. Samples tested at this level in the fall of 1930 gave growth gains of 26 g in the 8 weeks' period in the case of the raw and 13 g of the cooked sample, while in the following spring corresponding gains were 43 and 42 g for the raw and cooked samples from carrots kept in cool damp storage and 42 and 36 g, respectively, for those kept in warm dry storage.

From these and other data the authors conclude that carrots are a good source of vitamin B₁, that there is no appreciable loss of the vitamin in storage, and that cooking tends to bring about a slight loss in potency.

In the vitamin C experiments (guinea pigs), quantities of 10, 15, 20, and 30 g were tested. Complete protection against scurvy was not secured at levels below 30 g daily. The observed effects of cooking and storage are summarized as follows:

"In general, mature carrots raised in Gallatin Valley contain a fair amount of vitamin C so that 30 g, fed raw or cooked in the fall, appear to be quite sufficient for protection from scurvy and for growth of guinea pigs. In the spring, after storage in cool or warm cellars, the raw carrots seem to have increased in their protective influence against scurvy and also promote greater growth. When the stored carrots are cooked, however, there is noted a definite loss in ability to promote growth. These results would indicate that storage increased the availability of vitamin C in raw carrots, but caused the vitamin to be more sensitive to oxidation upon cooking."

The results of the vitamin studies on the canned carrots are summarized as follows: "When carrots are canned in the fall by either the pressure cooker or oven method and are tested at once for their vitamin content, there seems to be no loss in vitamin A, slight evidence of loss in vitamin B₁, but a decided loss in vitamin C. When canned carrots are kept for a period of 6 months, a noticeable loss has occurred in vitamin A, a decided loss in vitamin B₁, and vitamin C has been reduced to about one third of its initial potency."

From the standpoint of vitamin preservation and palatability, storage is recommended as a better method of preserving carrots than canning, and from the standpoint of palatability and keeping quality a cool damp cellar is to be preferred to a warm dry cellar.

The effect of storage on the palatability and vitamin content of rutabagas, J. E. RICHARDSON and H. L. MAYFIELD (*Montana Sta. Bul.* 277 (1933), pp. 12, figs. 3).—This study is similar to the one noted above except that the vitamin tests were confined to B₁ and C and the methods of preservation to storage in a warm dry cellar and a cool damp cellar. The rutabagas were harvested in the fall of 1930 and 1931.

The rutabagas stored in a cool damp cellar were in excellent condition throughout the entire period of 6 months, while those stored in slightly damp sand in an ordinary cemented basement had a high percentage of spoilage and the few remaining unspoiled were tough and had a strong bitter taste.

In the vitamin B₁ tests, quantities of 2.5 and 5 g were fed. The minimum dosage was not established, as none of the experimental animals showed polyneuritic symptoms. The rats fed cooked rutabagas did not appear to be in as good condition as those fed raw samples. In the vitamin C tests (guinea pigs), the amounts fed daily ranged from 1 to 10 g. Even the smallest amount gave complete protection in the 1931 samples when fed raw in the fall. The general conclusions drawn are as follows:

"Rutabagas are a good source of the antineuritic vitamin B₁ and an excellent source of the antiscorbutic vitamin C. The winter storage of rutabagas in either cool, damp or warm, dry storage cellars causes no appreciable loss in the potency of vitamins B₁ and C. The cooking of rutabagas by boiling causes greater loss of vitamins B₁ and C in the fall than after the roots have been stored during the winter."

Studies on growth.—I, Growth factors in liver. II, The effect of vitamins B and G on the consumption and utilization of food, C. E. GRAHAM and W. H. GRIFFITH (*Jour. Nutrition*, 6 (1933), No. 2, pp. 179-194, figs.

3; 195-204, *figs.* 7).—These two papers constitute the complete report of an investigation noted previously from preliminary reports (E.S.R., 62, p. 493; 66, pp. 63, 195).

A study of the reserves of vitamin A in the livers of native mine labourers, with special reference to their resistance to pneumonia, F. W. Fox (*Lancet* [London], 1933, I, No. 18, pp. 953-955).—In this contribution from the South African Institute for Medical Research, Johannesburg, data on the vitamin A content, as determined colorimetrically, of the livers of 63 native mine laborers, 19 of whom died from accidental causes and 44 from pneumonia, are reported and compared with similar data (E.S.R., 68, p. 706) reported by Wolff from the Netherlands and Moore from England. The methods followed were substantially those described by Moore. In this connection the possibility is suggested that extremely low values occasionally recorded by all observers may be due to the survival in the final extract of some inhibitor of the color reaction. The same wide variations in blue values were obtained as reported by previous observers, although the subjects were all males of similar age, physique, occupation, and diet.

Of the 19 livers obtained from accident cases, 14 were from miners. The lowest, highest, and average values for this group were 12, 938, and 297 blue units, respectively, as compared with a range of from 0 to 1,210 and an average of 269 reported by Wolff for 78 cases and a range from 0 to 1,800, with an average of 367, as reported by Moore. In the pneumonia group there were 35 cases untreated with vitamin A. The livers of these gave a range of from 0 to 488 and an average value of 148 blue units as compared with averages of 215 for 94 cases reported by Wolff and 182 for 60 cases reported by Moore. In the present study 9 of the pneumonia patients had received generous amounts of vitamin A during the illness. The range for this group was from 0 to 843, with a mean value of 173 blue units.

The substantial agreement shown in all three studies in lower vitamin A concentration in the livers of persons dying from pneumonia than in those dying from accidental causes leads the author to state that "there is no longer any doubt that persons dying from pneumonia tend to have lower reserves of vitamin in their livers than those who have died from accidental causes." The question is raised as to whether these findings mean that there is a drain upon the reserves of vitamin A during the disease, or that it is a case of lower reserves predisposing to infection. The latter is considered more plausible, although this hypothesis is presented with due caution, for the concluding statement is as follows:

"Whilst it seems more probable that the lower levels of vitamin A found in the livers of persons dying from pneumonia existed before the disease began, and are not due to dramatic demands made upon the reserves during the progress of the disease, it cannot be regarded as established that such lower levels have directly predisposed the individual to infection, though they may well be an indication of a state of malnutrition which is of importance in this respect."

Vitamin A treatment in infancy [trans. title], F. ERBEN (*Deut. Med. Wchnschr.*, 59 (1933), No. 25, pp. 954-956).—Clinical observations are summarized on the treatment of 40 infants and young children with a vitamin A concentrate of the trade name Vogan. Nearly all of the subjects were markedly underweight and were suffering from infections and various disorders. The concentrate was administered in amounts furnishing 20,000 rat units a day (a rat unit being defined as the smallest daily dose capable of promoting a gain in weight in young rats of 15 g in 5 weeks and protecting 60 percent of the animals

against eye trouble). The treatment was continued for from 8 to 66 days, with an average of 27 days.

In 17 of the 23 subjects who were markedly underweight, the treatment was accompanied or followed by a marked increase in weight. A lessening of recurrence of catarrhal infections was not observed, although as a rule the infections following treatment were less severe and had less effect on the general well-being and weight. In constitutional eczema the Vogan was without marked effect.

Respiratory troubles in tuberculous rats in relation to deficiency in vitamin A [trans. title], G. SZULC and S. KOŁODZIEJSKA (*Compt. Rend. Soc. Biol. [Paris]*, 112 (1933), No. 6, pp. 595, 596).—Observations are reported indicating that tuberculous rats on a diet deficient in vitamin A suffer from severe respiratory trouble, while similar rats on diets containing this vitamin in abundance are not thus affected. The administration of 2 drops of a concentrate of vitamins A and D, Irradiostoleum, to each of 3 rats at the moment of respiratory difficulty was followed by complete disappearance of the trouble on the following day, while 6 other rats not receiving the concentrate succumbed several days after the appearance of the respiratory trouble and showed on autopsy hyperemia of the lungs, inflammatory processes, and bronchitis.

The authors conclude that the respiratory troubles in rats deprived of vitamin A and infected with tuberculosis are the consequence of the action of the tubercle bacillus in the absence of vitamin A, and express the opinion that analogous phenomena are produced in human tuberculosis. The absence or insufficiency of vitamin A in the diet during the winter and spring may cause respiratory troubles favoring the development of pulmonary tuberculosis and facilitating the dissemination of the organism by coughing and sneezing.

The effects of codliver-oil concentrate injections, B. GORDON and R. J. TITHERINGTON (*Amer. Rev. Tuberc.*, 27 (1933), No. 4, pp. 368-374).—The investigation, of which this is the preliminary report, was undertaken on account of the difficulty experienced by some tuberculous patients in tolerating large doses of cod-liver oil concentrate previously shown to be of value in building up vitamin A reserves (*E.S.R.*, 67, p. 489). Both laboratory experiments (curative tests with rats) and clinical observations are reported. The concentrate used was a protein-free concentrate of cod-liver oil sterilized by the cold process and suspended in olive oil. Each 1-cc ampoule contained 4,000 units of vitamin A with high antirachitic value as well.

In the laboratory experiments 14 rats showing severe vitamin A deficiency received single subcutaneous injections of 0.5 cc of the concentrate, and 7 received the concentrate orally in 1-cc doses. Five animals served as negative controls. All of the untreated animals died. In the group receiving the concentrate orally 3 died and the others showed a gradual disappearance of the symptoms of vitamin A deficiency. In the injected group there were 2 deaths, while the others were cured of xerophthalmia and showed striking improvement in general condition, with rapid increases in weight. There were no harmful effects beyond an abscess at the site of injection in a single animal. The degree of calcification of bones was greater in the treated than in the untreated animals.

In the clinical studies, after skin tests to prove that there was no possibility of local or general anaphylactic reactions, hospital patients suffering from pulmonary tuberculosis of advanced or moderately advanced type, with subnormal weight, were given daily or three times weekly subcutaneous, or in a few cases intramuscular, injections of the concentrate for varying lengths of

time up to 7 weeks. The effects of the injections could not be evaluated with any certainty. The impression was gained, however, that there was general improvement following the administration but no specific effect on the tuberculous lesions. The results were considered sufficiently favorable to warrant the suggestion that "cod-liver oil concentrate injections should be considered in patients who have been unable to take a standard diet (for a long period of time), and who cannot tolerate the oral administration of cod-liver oil or accessory food substances."

Pyruvic acid and vitamin B₁ deficiency, A. P. MEIKLEJOHN, R. PASSMORE, and R. A. PETERS (*Biochem. Jour.*, 26 (1932), No. 6, pp. 1872-1879, figs. 3).—Following the same technic as in earlier studies of the relation of vitamin B₁ to the lactic oxidase system in the brains of pigeons (*E.S.R.*, 68, p. 867), the authors investigated the behavior of normal and avitaminous pigeon brains in the presence of pyruvic acid. The unexpected finding was that the oxygen uptake in the presence of pyruvate is always much more depressed than with lactate in the avitaminous brain and, further, that this depression is not improved as in the case of lactate by the addition of vitamin B₁ concentrate. Normal pigeon brains showed good oxygen uptake with pyruvate as substrate.

The defect in oxidation was not associated with the high content of lactic acid in the avitaminous brain. This suggests that pyruvic acid is not a stage in the oxidation of lactic acid in the pigeon's brain.

Vitamin B₄, H. BARNES, J. R. P. O'BRIEN, and V. READER (*Biochem. Jour.*, 26 (1932), No. 6, pp. 2035-2040, pl. 1).—This is a detailed report of an investigation noted previously from a preliminary report (*E.S.R.*, 68, p. 726). Photographs are included of a rat suffering from deficiency of vitamin B₄ and the same animal after 1 week's treatment with 0.01 mg daily of the active material. A microphotograph of the crystalline hydrochloride is also included. The tentative formula suggested is $C_4H_4N_4.HCl.1/2H_2O$.

Vitamin C, H. C. SHERMAN ET AL. (*Amer. Pub. Health Assoc. Year Book*, 1932-33, pp. 97-99).—This summary of recent advances in knowledge of the chemistry of vitamin C and the extent of its conservation in various foods subjected to manipulative processes constitutes the annual report for 1932 of the committee on nutritional problems of the food and nutrition section of the American Public Health Association.

Vitamin C and hexuronic acid, T. MOORE and S. N. RAY (*Nature [London]*, 130 (1932), No. 3296, pp. 997, 998).—Attention is called briefly to observations that the adrenal glands of normal guinea pigs are blackened by silver nitrate solution, while those of scorbutic animals are not. No differentiation between cortex and medulla was noted. In some preliminary experiments on rats the adrenals were blackened even when the animals had been kept for prolonged periods on a vitamin C-deficient diet. This was also the case when the animals were in a state of extreme emaciation from the simultaneous absence of vitamin A and vitamin B (complex).

The evidence is thought to give further support to the belief that vitamin C and hexuronic acid are identical, "or at least that their roles are closely inter-related", and also to the view that the rat is capable of synthesizing vitamin C.

Vitamin C content of Baldwin apples and apple products, C. R. FELLERS, M. M. CLEVELAND, and J. A. CLAGUE (*Jour. Agr. Res. [U.S.]*, 46 (1933), No. 11, pp. 1039-1045, figs. 6).—This contribution from the Massachusetts Experiment Station gives the first results of an investigation which is being made of the important apple varieties of the Northeast and the effect of various factors upon the vitamin content of apples and apple products. The Baldwin apple was used exclusively in this study, and a comparison was first made of the

vitamin C content of fruit from unsprayed trees and from trees receiving seven or eight sprayings of lime-sulfur and lead arsenate. The season was dry, and at the time of picking the fruit from the sprayed trees contained from 0.005 to 0.008 grain of As_2O_3 per pound of fresh fruit. The studies were begun in October 1931 and the apples were stored at 36° F. until the completion of the tests.

The apples from the sprayed trees contained at least as much vitamin C as those from the unsprayed trees. Four g of radial sections of the fruit of either sufficed for growth and complete protection from scurvy in 300-g guinea pigs. In the remaining tests the apples from sprayed trees only were used.

In from 4 to 6 months' storage, the period during which apples of this variety are consumed in largest quantities, there was only about a 20 percent loss in vitamin C, but after from 8 to 10 months the loss was nearly 40 percent.

Juice extracted daily from apples which had been in storage 9 months and the protective dose of which was approximately 6 g was found to be nearly as rich in vitamin C as the apples from which it was made and little loss occurred during the first 24 hours after extraction. Benzoated or pasteurized cider prepared in the usual commercial way did not retain appreciable quantities of vitamin C. Eight g of cider preserved by either method failed to support growth or protect from scurvy. Canned apple sauce, strained or unstrained, was a poor source of vitamin C, although the unstrained was slightly superior to the strained. Ten g of either, however, proved insufficient to protect guinea pigs against scurvy or to maintain weight.

Vitamin C distribution in Baldwin and McIntosh apples, C. R. FELLERS, P. D. ISHAM, and G. G. SMITH (*Amer. Soc. Hort. Sci. Proc.*, 29 (1932), pp. 93-97, figs. 3).—In continuation of the investigation noted above, the distribution of vitamin C in various parts of the apple was studied in Baldwin apples held in storage from October to February. Five g of radial sectors of the whole apple were required for complete protection against scurvy and gave normal weight gains, thus indicating a loss of about 20 percent of the vitamin C during storage. One g of the epidermis, the smallest amount tested, was fully protective and it is thought that 0.5 g would likewise have been protective. Of the flesh next the epidermis, 1 g barely sufficed to prevent scurvy and 3 g afforded full protection and gave normal weight gains. From these results it is estimated that 2 g would have afforded full protection. Of the flesh next the core 4 g failed to promote growth or protect against scurvy. "On this basis the epidermis is about 4 times as rich as the flesh immediately beneath it and 6 to 10 times as rich as the flesh near the core."

Fresh McIntosh apples tested in the fall of 1932 proved to be a very poor source of vitamin C. Full protection against scurvy was not secured on 25 g daily of radial sectors, including the epidermis. A slight degree of protection was secured with 2 g of the epidermis. It is estimated that the McIntosh is approximately from one sixth to one tenth as rich in vitamin C as the Baldwin apple.

A few additional tests on apple juice and apple sauce from Baldwin apples showed the fresh centrifuge-extracted juice to be only slightly less potent than the fruit itself, and pressed sweet cider only a few days old to be about 50 percent as potent as the apples from which it was made. Freshly prepared unstrained apple sauce retained approximately 20 to 30 percent of the original vitamin C content of the juice.

Vitamin C in the adrenal gland, G. BOURNE (*Nature [London]*, 131 (1933), No. 3320, p. 874, fig. 1).—Cytological preparations of vitamin C in the adrenal glands of various animals have been obtained by suspending pieces of the gland

in the vapor of formaldehyde obtained by heating paraformaldehyde and, after fixation, placing the pieces in a 2.75 percent solution of silver nitrate for 24 hours. Descriptions are given of the site and extent of impregnation on staining in the adrenal glands of the mouse, cat, and guinea pig. In the mouse the cortex was stained first and the medulla after 2 or 3 hours. Both cortex and medullary cells contained large numbers of small, brownish-black granules. The nucleus of the cells was practically surrounded by a mass of granules, the cytoplasm was bordered by aggregations of the granules, and a number were scattered through the cytoplasm itself. In the cat the peripheral cortical cells tended to impregnate more strongly than the inner cortical cells and the medulla. Guinea pig adrenals showed impregnation of both cortex and medulla.

Vitamin C and the suprarenal cortex.—I, Antiscorbutic activity of ox suprarenal, L. J. HARRIS and S. N. RAY (*Biochem. Jour.*, 26 (1932), No. 6, pp. 2067–2075, figs. 2).—This is the detailed report, with experimental data, of an investigation noted previously from a preliminary report (*E.S.R.*, 67, p. 650). In addition it is announced that “preliminary results show that in guinea pigs—a species which resembles man and monkeys but differs from many others, including dogs and rats, in being unable to synthesize vitamin C in vivo when none is provided in the food—the vitamin C activity of the suprarenal is lost with the onset of scurvy. It is supposed that vitamin C plays a special role in the physiology of the suprarenal. The occurrence of distinctive hypertrophic changes in the suprarenals in scurvy is in keeping with this.”

The antiscorbutic activity of the cortex of the suprarenal gland of the ox, S. S. ZILVA (*Biochem. Jour.*, 26 (1932), No. 6, p. 2182, fig. 1).—Data are reported graphically on the relative antiscorbutic potency of ox suprarenal cortex and decitrated lemon juice. The former was fed to standard guinea pigs in doses of 0.25, 0.5, and 1 g and the latter in doses of 0.3, 0.5 and 1 cc. The suprarenal cortex was in each case more effective than the decitrated lemon juice tested at the same time and under the same conditions.

The antiscorbutic value of fresh lime juice, A. HASSAN and R. BASILI (*Biochem. Jour.*, 26 (1932), No. 6, pp. 1846–1850).—The juice of Egyptian limes prepared from ripe fruits gathered not longer than 2 days before using protected 300–400 g guinea pigs from scurvy at a minimum dosage of 1.5 cc daily. The juice prepared under the same conditions but kept in the refrigerator during the whole period of the experiment, approximately 2 months, did not protect against scurvy.

The authors attribute the low antiscorbutic values for lime juice previously reported by Chick et al. (*E.S.R.*, 42, p. 57) and by Davey (*E.S.R.*, 45, p. 869) to the fact that in both instances the juice was prepared from imported limes which were in transit from 4 to 8 weeks before the beginning of the experiment and the juice was expressed at one time for the entire feeding period. It is thought that the loss of vitamin C from lime juice takes place much more rapidly than from lemon juice and probably starts in the intact fruit.

The E vitamin (antisterility or fertility vitamin) [trans. title], F. VERZÁR (*Ztschr. Vitaminforsch.*, 1 (1932), No. 2, pp. 116–134).—This comprehensive literature review contains a chronological list of 58 references to the literature covering the period from 1922 to January 1932, together with 9 miscellaneous citations.

Efficacy of intraperitoneal injection of iron in the nutritional anemia of rats, M. W. EVELETH, F. C. BING, and V. C. MYERS (*Soc. Expt. Biol. and Med. Proc.*, 30 (1933), No. 7, pp. 852–854).—In a further effort to explain conflicting results concerning the necessity for copper as a supplement to iron for the recovery from nutritional anemia in rats (*E.S.R.*, 67, p. 346), the effect was studied of intraperitoneal injections of solutions of ferric chloride in rats

made anemic by exclusive feeding with certified milk. The stock ferric chloride solution prepared from electrolytic iron was diluted with warm sterile saline solution prepared from copper-free sodium chloride, adjusted to pH 2-2.5, and injected in quantities of 0.5 cc. The injections were given every other day, and hemoglobin determinations and red cell counts were made at regular weekly intervals.

All of the animals grew well regardless of dosage and were able to increase the hemoglobin concentration of the blood to an extent depending upon the dosage of iron. With 0.5 mg or more, normal hemoglobin levels of from 12 to 15 g per 100 cc of blood were reached in 7 weeks or less. With 0.2 mg, regeneration was slower, but was complete in about 14 weeks. On lower dosages hemoglobin concentrations of 8-10 g per 100 cc of blood were reached in 22 weeks, at which time the experiment was discontinued. The erythrocytes in this group increased from an average initial level of 2.3 to 3.3 million per cubic millimeter of blood to 11 million and over.

In a further series of animals receiving, in addition to injections of iron in doses of from 0.025 to 0.5 mg every other day, 0.025 mg of copper in the form of CuSO_4 solution either injected with the iron or fed by mouth on alternate days, growth was identical with that on iron alone, and the hemoglobin increased to an extent depending upon the dosage of iron. "The failure of copper to speed up the rate of hemoglobin production when the iron is administered parenterally indicates to us that the role of copper in hemoglobin production must now be evaluated in terms of iron absorption."

It is noted in conclusion that the milk used contained an average of 0.34 mg of copper per liter, as estimated by the Biazzo procedure described by Ansbacher, Remington, and Culp (E.S.R., 66, p. 505), but that preliminary experiments have indicated that the injection of iron solutions is also effective in rats made anemic on milk containing only 0.14 mg of copper per liter.

The higher carbohydrate diet method in diabetes mellitus: Analysis of one thousand and five cases, P. A. GRAY and W. D. SANSUM (*Jour. Amer. Med. Assoc.*, 100 (1933), No. 20, pp. 1580-1584, fig. 1).—This discussion is based on the analysis of 1,005 histories of cases of diabetes mellitus admitted to the metabolic division of the Santa Barbara College Hospital and to the Sansum clinic between January 1, 1925, and January 1, 1932, and receiving the higher carbohydrate diets during their period of treatment.

During the major part of this 7-year period, the diet formulas contained about 2 g of carbohydrate to 1 of fat, but in the last 2 years some patients received diets with carbohydrate-fat ratios of 3:1 or 4:1. "Patients with mild diabetes have done well on such formulas; patients with severe diabetes have not." The dietary treatment is further described as follows:

"In prescribing higher carbohydrate diets, no distinction has been made between the insulin and the noninsulin patients. Insulin has been prescribed only when the patient was unable to metabolize an adequate diet without persistent glycosuria or prolonged hyperglycemia. A preliminary period of undernutrition was practiced during the early part of the period covered by this study, but has since been abandoned as unnecessarily prolonging hospitalization. The diets prescribed have fallen into three general groups: (1) Maintenance, (2) 'weight-reducing', and (3) 'weight-gaining.' By a maintenance diet we mean one that will maintain body weight constant at a level about 10 percent below the average allowed in actuary tables for age, sex, and height. For adults, we have found 30 calories per kilogram of body weight sufficient. Many patients even maintain their weight for long periods of time on less without apparent detriment. Our children have received from 45 to 80 calories per kilogram of body weight, depending on their age."

Of 70 patients treated with the higher carbohydrate diets continuously for 7 years, 21 were in satisfactory control (maintenance of both normal blood sugar level and sugar-free urine specimens), 44 in partial control, and 5 uncontrolled (showing persistent glycosuria and hyperglycemia). In 42 patients there was an improvement in sugar tolerance as measured by increased diet or reduced insulin. All of the patients reported a sense of increased well-being and physical fitness.

TEXTILES AND CLOTHING

The clinging power of cotton and the number of convolutions per centimetre, R. L. N. IYENGAR (*Indian Jour. Agr. Sci.*, 3 (1933), No. 2, pp. 320-333, figs. 6).—Tests on lint of Cambodia (*Gossypium hirsutum*) cotton gave results indicating that variation in the convolutions has no effect on the normal clinging power.

Spinning tests of selected bales of sea island, American-Egyptian, and Egyptian-Sakellaridis cotton, M. E. CAMPBELL (*U.S. Dept. Agr., Bur. Agr. Econ. and Bur. Plant Indus.*, 1933, pp. 17, figs. 4) —Parallel spinning tests were made on two bales of selected South Carolina sea island cotton—one each of the 1929 and 1930 crops—developed by the U.S. Department of Agriculture, and selected commercial bales each of Florida sea island, American-Egyptian (Pima), and Egyptian-Sakellaridis cotton. The sea island lots were found considerably superior in strength, the Sakel slightly superior, and the Pima about average, when compared with results of earlier tests of cottons of corresponding varieties. According to the strength data for yarns and to the observations made during manufacture, the sea island cottons studied meet well the specifications of yarns for fabrics intended for mechanical purposes, demonstrating and substantiating the fact that the present sea island stock compares favorably in spinning quality with the sea island cotton of earlier years.

Changes in solubility and absorption spectra of silk fibroin caused by tin weighting, J. L. SOUTHARD and E. L. TAGUE (*Jour. Home Econ.*, 24 (1932), No. 11, pp. 995-1002, figs. 4)—Following a brief review of the literature on theories concerning the chemical nature of silk fibroin, a study is reported which had the twofold purpose of determining what changes in solubility, if any, might be detected in silk fibroin after weighting by the tin phosphate silicate process and of using the absorption spectra of the silk solution as an indication of whether the silk fibroin consists of one or more phases (crystalline and amorphous) as suggested in the literature.

The fabric used, which was prepared at the Cheney Research Laboratories, consisted of one portion of unweighted silk and two weighted by the tin phosphate silicate process 25 and 40 percent above par. After the silk was received at the laboratory the weighting was removed from part of the more heavily weighted process, thus giving for examination four pieces of silk: A unweighted, B weighting removed, C weighted, and D overweighted. Small specimens, after conditioning, were boiled for about 20 minutes in a concentrated solution of hydrated calcium chloride, $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$. Samples A and B went completely into solution, while of the two weighted samples 47 percent by weight of C and 56 percent of D remained undissolved.

Analyses of the fabrics and the insoluble portions indicated that a small amount of the weighting went into solution with the soluble portion of the fibroin, and that a portion of the protein was combined with the insoluble weighting complex. As determined by the Kjeldahl method 12 percent of the fibroin from fabric C and 23 percent of that from fabric D were thus accounted for.

Spectrum analyses of solutions of the silk protein from the four samples at 1, 0.5, and 0.25 percent concentration showed with increasing dilution and time of exposure an increase in transmission in the region of 2,500 Å. Two distinct and widely separated areas of absorption occurred. Absorption decreased in the zone from 2,500 to 2,900 Å and to a lesser degree in the zone from 2,200 (the limit of the quartz cell) to 2,400 Å. The solutions from fabrics A and B showed much greater absorption than those from the weighted silk. This is thought to afford further proof that there are at least two fractions in silk fibroin.

"Protein combined with the absorbed weighting may be identical with either or both fractions or it may be an entirely different fraction with entirely different absorption properties. The behavior of the absorption complexes indicated that they might be responsible for loss of viscosity and increased brittleness in the protein. Fabrics A and B formed a sticky, viscous mass as they went into solution, but fabrics C and D had a more or less brittle, insoluble portion which readily fell apart when the solution was diluted with distilled water."

HOME MANAGEMENT AND EQUIPMENT

The human energy cost of certain household tasks, VEN. W. SWARTZ (*Washington Col. Sta. Bul.* 282 (1933), pp. 24, figs. 3).—This is the final report of an investigation noted from a progress report (E.S.R., 68, p. 874). The energy consumption was calculated from measurements of oxygen consumption with the Benedict knapsack apparatus, which is described and illustrated. Fifteen women served as subjects for the 1,181 experiments comprising the investigation. From 2 to 7 subjects were used for each task and 4 took part in the investigation over a period of 2 years. Tabulated information is given concerning the physical characteristics of the subjects, and the energy consumption values are reported in calories per square meter of body surface per hour and in percentages above the resting values for the individual subjects.

An arbitrary classification of tasks according to their energy demands upon the body was established as light, under 100 percent above resting values; moderately heavy, from 100 to 150 percent; heavy, from 150 to 200 percent; very heavy, from 200 to 300 percent; and extremely heavy, above 300 percent. With this classification the tasks studied fell into the following divisions: Light work, paring potatoes, ironing (either standing or sitting), and beating a batter; moderately heavy tasks, kneading dough and most laundry tasks where modern equipment is used; heavy tasks, rinsing clothes, hanging them from a basket on the floor, washing clothes by hand, and wringing with a hand-power wringer.

Each of these tasks is considered in considerable detail. In some instances the tasks were broken up into small units, and comparisons were made of the energy required for each unit following different methods or in different positions. For instance, a comparison is reported of the energy cost of wringing clothes (together with the amount of water remaining in the clothes) by hand, average 138 percent above resting values; hand wringer 197, electric wringer 99, and electric extractor 125 percent above resting.

Among the other factors studied were the effect of height of board, of sitting and standing, and the use of the electric ironer and different kinds of hand irons on the energy cost of ironing napkins and the effect of height of table on the energy cost of beating cake batters and kneading bread dough.

In discussing the significance of the data obtained in such an investigation as this, the author points out that there is considerable variation in the energy

requirements of different people for the same tasks and that in estimating the calorie needs of an individual only an approximation can be expected from the use of published tables of average expenditures of energy. It is also noted that energy expenditures are not a direct measure of fatigue. "The fatigue is probably roughly proportional to the energy expended, but it certainly cannot be said to be in direct ratio."

The consumption and home production of goods (*Wisconsin Sta. Bul.* 425 (1933), pp. 53, 54).—A brief summary is given of a study by M. L. Cowles and G. Lamb of the consumption and production for home use of the principal articles of food in 197 of the households involved in the investigation noted on page 889.

Utensils for the electric range, E. H. ROBERTS (*Washington Col. Sta. Bul.* 283 (1933), pp. 20, figs. 2).—This bulletin gives the general and a few specific conclusions reached in an extensive investigation of the relative efficiency of various types of surface units for an electric stove and of utensils of various sizes, shapes, and materials for surface and oven cooking. The units tested included rod, ring, cone, open, and solid types and the utensils saucepans with flat bottoms and straight sides, others with small bottoms and flaring or convex sides, shallow and tall pans, and rough and shiny pans. Altogether, 8 utensils of aluminum, 10 of enamel ware, 2 of stainless steel, and 4 of copper, 1 iron dutch oven, and 1 glass casserole were used.

The method followed in the surface burner tests consisted essentially in heating a definite amount of water, usually 1,000 or 1,500 g (approximately 1 or 1½ qt.), to the boiling point and measuring the time required to bring the water to this temperature, the time during which it remained boiling, and the loss in weight of the water. By means of a special watt hour meter the electric input in decimal parts of a kilowatt-hour was also measured. Temperatures were obtained with a thermocouple connected to a pyrometer inserted in the water.

The oven tests were similar except that after the utensil filled with water had been placed in the oven the oven was heated with both units switched to high until the indicator reached 400° F. The upper unit was then shut off and the oven held at this temperature by thermostatic control until the temperature of the water reached 200° when the lower unit switch was turned off. The utensil was left in the oven for an hour and then removed and weighed. In both cases the thermal efficiency of the utensil was determined by use of the following formula: The thermal efficiency equals the heat in calories absorbed by the metal of the utensil plus the heat absorbed by the water in the pan plus the heat lost by evaporation divided by the heat in calories supplied by the electricity times 100.

The tabulated data reported include the effect of wattage variation on the time to boil and the thermal efficiency of aluminum pans on small and large open units; the characteristics of various surface units as regards speed in heat, heat retention, electric input, thermal efficiency, durability, and replacement cost; and the thermal properties of various oven utensils as regards time to reach 200°, electric input, and thermal efficiency. Among the practical conclusions drawn are the following:

The most desirable features in an efficient surface unit for the electric stove are speed in heating, good heat retention, durability, flatness of upper surface, low cost of operation, and low cost of replacement. The maximum wattage for each size of unit is apparently the most efficient. The characteristics of an efficient utensil for top stove cooking on the electric stove are a dull-surfaced flat bottom, highly polished straight sides, a well-fitting cover, and material heavy enough to insure durability with no warping. The diameter of the pan should be equal to or greater than that of the unit on which it is used. The

most efficient oven utensil is one which has an outer surface which readily absorbs or transmits radiant heat, as rough iron, enamel, porcelain, or glass and the least efficient one which has a highly polished surface which reflects radiant heat.

Thickness of an aluminum utensil as a factor in its thermal efficiency when used in surface cookery on an electric range, V. E. SATER and L. J. PEET (*Jour. Home Econ.*, 25 (1933), No. 4, pp. 324-326).—Six aluminum pans of different gages of sheet metal were made to order from the same mold, fitted with lids of the same gages as the pan, and tested for their thermal efficiency on three types of surface units of an electric range. Ten tests were made with each utensil, the efficiency being determined from the heat required to raise the same amount of water from an initial temperature of 15° C. to a final temperature of 90°.

The pans giving the minimum and maximum efficiencies for the three types of units were for the calrod unit No. 18 gage with an efficiency of 41.33 percent and No. 14 with an efficiency of 46.3 percent, respectively; for the closed unit No. 14 with 33 and No. 16 with 43.23 percent efficiency; and for the open unit No. 18 with 36.95 and No. 12 with 38.97 percent efficiency, respectively.

These figures show that the largest variations in the efficiency of the pans occurred on the closed and the smallest on the open unit. With the exception of pan No. 16 on the closed unit all of the pans showed higher efficiencies on the calrod unit. The data are thought to suggest that for general use pans of the medium gages may prove more efficient than the thickest and thinnest.

MISCELLANEOUS

Forty-third Annual Report of the Storrs Agricultural Experiment Station, Storrs, Connecticut, for the year ending June 30, 1931 (*Connecticut Storrs Sta. Rpt. 1931*, pp. [4]+292, pls. 2, figs. 42).—This consists of reprints of Bulletins 176-180, previously noted.

Work and progress of the [Idaho] Agricultural Experiment Station for the year ending December 31, 1932, E. J. IDBINGS (*Idaho Sta. Bul. 197* (1933), pp. 60).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

Report of Moses Fell Annex Farm, Bedford, Indiana, June 1933, H. J. REED and H. G. HALL (*Indiana Sta. Circ. 197* (1933), pp. 12, figs. 3).—The experimental work summarized is for the most part abstracted elsewhere in this issue.

Agricultural investigations at the Huntley (Mont.) Field Station, 1927-1930, D. HANSEN, A. E. SEAMANS, and D. V. KOPLAND (*U.S. Dept. Agr., Tech. Bul. 353* (1933), pp. 50, figs. 6).—In addition to meteorological data, the experimental work reported is for the most part noted elsewhere in this issue.

[Annual Report of Puerto Rico Insular Station, 1929], M. T. COOK ET AL. (*Puerto Rico Dept. Agr. and Com. Sta. Ann. Rpt. 1929, Eng. ed.*, pp. 107).—The data included in this report have been previously noted (E.S.R., 66, p. 299).

[Annual Report of Puerto Rico Insular Station, 1932], F. A. LÓPEZ DOMÍNGUEZ (*Puerto Rico Dept. Agr. and Com. Sta. Ann. Rpt. 1932, Spanish ed.*, pp. 49).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Facts for farmers: Annual report of the director, [Wisconsin Station, 1932], compiled by N. CLARK (*Wisconsin Sta. Bul. 425* (1933), pp. 144, figs. 34).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

California University.—*Science* notes that a tract of 2,600 acres of forest land in Eldorado County has been given to the university for a school forest. The tract is located near Placerville within the boundaries of the Eldorado National Forest, and is for the most part well covered with excellent second-growth timber. It will be managed by the division of forestry of the College of Agriculture, which now has an enrollment of approximately 125 undergraduate students.

Colorado College and Station.—E. A. Lawver, former city engineer of Fort Collins, has been appointed testing engineer in the civil and irrigation engineering section vice D. A. Wigle, resigned.

Delaware Station.—Dr. A. A. Horvath has been appointed chief chemist.

Florida Station.—Research in progress for the past four years on anaplasmosis in cattle was brought to a conclusion on September 1 when the laboratory at West Palm Beach was discontinued, and Dr. D. A. Sanders, veterinarian, who was conducting the project, was transferred to the main station at Gainesville. It has been found that anaplasmosis can be transmitted from sick to healthy cows by means of the eastern wood tick, which occurs in parts of Florida free of the cattle fever tick, and also mechanically by the large brown horsefly and the stable fly.

The effect of soils and fertilizers on the growth of celery is being studied in a field laboratory recently opened at Sanford. The studies are aimed particularly at the improvement of the Florida celery crop and are under the direction of Dr. E. R. Purvis.

Fred W. Walker, assistant entomologist at Monticello since 1927, was killed in an automobile accident on October 9. He was a native of Georgia, 41 years of age, and received his college training at the University of Florida. He had specialized in studies of pecan insects, notably the pecan shuck worm and the leaf and cigar casebearer.

Idaho University and Station.—Walter H. Olin, director of agricultural extension from 1911 to 1914 and director of substations, died at Dolores, Colo., on June 20. He was born in Walnut Grove, Calif., on August 7, 1862, and educated at the Kansas College, where he received the B.S. degree in 1889 and the M.S. degree in 1893. In addition to much experience in commercial and public school work, he had served as instructor in farm crops in the Iowa College from 1902 to 1904 and as professor of agronomy in the Colorado College from 1904 to 1906 and as vice dean of agriculture there from 1906 to 1908. He was the author of *American Irrigation Farming* (1913).

Kansas College and Station.—The enrollment of the entering class showed a gain of 70 over the previous year, making a total of 2,299 students. The gain in the division of agriculture was 2 and in home economics 6.

The new college dairy barn and experimental laboratory was occupied this fall. It is a limestone building costing about \$45,000, with a main barn accommodating 70 cows and two wings supplying additional facilities including six digestion and metabolism stalls and eight pens for herd sires. A modern milk house is also provided.

Louisiana Stations.—A granite shaft with bronze inscription commemorative of the work of Dr. W. C. Stubbs (E.S.R., 51, p. 101), erected by the American Sugar Cane League, was unveiled October 17 at the laboratory buildings of the U.S. Sugar Plant Field Station at Houma.

Maryland University and Station.—The honorary degree of doctor of agriculture was conferred by the university at its recent commencement upon Earl W. Sheets, Chief of the Animal Husbandry Division, U.S. Bureau of Animal Industry.

Dr. Charles W. England has been appointed instructor and assistant in dairy manufacturing. Ray Hurley, assistant agricultural economist in the station, has been granted leave of absence until January 1, 1934, to assist the U.S. Farm Credit Administration. Indefinite furloughs without pay have been given the research specialist in home economics, the assistant pomologist, and two assistant seed analysts.

Minnesota University and Station.—The board of regents of the University has entered into an agreement with the Northwest Research Foundation for assistance in research activities. The foundation, which is composed of business men of Minneapolis, St. Paul, and elsewhere in the Northwest and is headed by James Ford Bell, is to raise funds to be turned over to the university for use in the investigations of the commercial possibilities of regional raw materials not now being fully utilized, such as peat, aspen wood, low grade wheat, and casein. The Northwest Research Institute, which is to be created within the university by the president and administered by a director to be appointed by him subject to the approval of the board of regents, is to carry on the work. It is contemplated that discoveries may be patented and turned over to a manufacturing concern under a licensing system. The proceeds will be used first to reimburse the donated fund for the cost of the research, second to reimburse the donors for their contributions without interest, and the remainder divided equally between the university outright and the foundation as a fund with which to finance further research.

New Hampshire Station.—The former dairy barn of the university has been converted into an agricultural engineering building. G. M. Foulkrod has been added to the agricultural engineering staff.

Rutgers University and New Jersey Stations.—Cooperative research is being maintained with the University of Chicago in the study of plant nutrition and with the Rockefeller Institute for Animal Research and the Cornell University Medical School in the study of poultry diseases.

Dr. W. R. Robbins, assistant olericulturist, has been transferred to the department of plant physiology as assistant professor of plant physiology and assistant plant physiologist. Howard F. Huber, assistant director of research, has been transferred to the department of vegetable gardening as assistant professor of vegetable gardening and assistant olericulturist. William C. Skelley, professor of animal husbandry, has been appointed manager of the college farm.

New York State Station.—In tests recently conducted at the station, a gas flame torch that attains a temperature of 1,950° F. has been found highly effective for sterilizing and drying milk cans. The method is believed to be thoroughly practical and economical, especially for milk plants equipped with large power can washers. Although certain mechanical details of installation are still under investigation, an exposure of eight seconds was found to leave the cans sufficiently sterile to meet the usual sanitary requirements. Treatment for this length of time had no ill effects on the cans, nor did it alter in any way the quality of the milk.

A collection of new varieties of apples, pears, plums, and grapes exhibited jointly by the station and the New York Fruit Testing Association at the recent

meeting of the Massachusetts Horticultural Society in Boston was awarded the society's gold medal for excellence and promise of the new fruits displayed. Most of the varieties originated on the station grounds, while a few originating elsewhere have proved especially promising in tests there. The collection included for new apples the Carlton, Kendall, Early McIntosh, Lodi, Macoun, Medina, Newfane, and Orleans; the Albion, Hall, and Stanley plums; the Cayuga, Gorham, Phelps, and Pulteney pears; and the Fredonia and several of the European types of grapes.

Pennsylvania College and Station.—Dr. Frank D. Kern, head of the department of botany and dean of the graduate school, has been granted leave of absence for a year to serve as acting dean of the College of Agriculture and Mechanic Arts of the University of Puerto Rico. It is expected that in this capacity he will also consolidate and unify under the management of the college the heretofore independent departments of the insular station, the Isabela Station demonstration farm, and the extension service, as provided by a recent act of the Territorial Legislature.

Rhode Island College and Station.—Under a plan designed to promote unity of administration, a School of Agriculture and Home Economics has been organized with major divisions of resident teaching, the experiment station, and the extension service. This school will be headed by G. E. Adams, the former dean of agriculture and director of the extension service, who will become dean of the School of Agriculture and Home Economics, director of the station, and director of extension. The school has also been subdivided into coordinate departments of plant industry, animal industry, biology and chemistry, home economics, and agricultural economics, and Dr. B. E. Gilbert, formerly director of the station, has been appointed vice dean of the school, director of research, and head of the department of biology and chemistry, as well as secretary of the graduate committee.

Subject to the approval of the dean and director, the director of research will be responsible for the promotion of research within the institution, including matters pertaining to the research personnel, the initiation and conduct of projects, the preparation of the budget, and the supervision of expenditures.

A research council which anticipates unifying the entire research work of the college has also been organized. This council will hold periodic meetings, in which the specialists in research will be given opportunity to become acquainted with each other's work. It will have no executive function but will encourage investigational work, promote the research idea, and constructively criticize both proposed projects and interpretations of data from mature projects, and will receive reports from members of the staff who attend meetings of national scientific societies.

Texas Station.—A new variety of fig which may be picked green and ripened during the marketing period is being developed. It is claimed that figs of the new variety turn purplish brown about 10 days before they ripen and will continue to ripen if picked thereafter.

Virginia Station.—J. L. Maxton, assistant agricultural economist, who has been on leave for graduate work at Cornell University, resumed his duties July 1. C. J. Blair, Jr., assistant agricultural economist, resigned September 2.

G. W. Patteson, agronomist in charge of the soil survey, resigned August 9. Dr. S. S. Obenshain was appointed assistant agronomist in charge of the soil survey, effective October 15.

Wisconsin University.—Nellie Kedzie Jones, State leader of home demonstration agents and widely known for her pioneer work in home economics in Kansas and Wisconsin, has retired as emeritus professor of home economics.

UNITED STATES DEPARTMENT OF AGRICULTURE

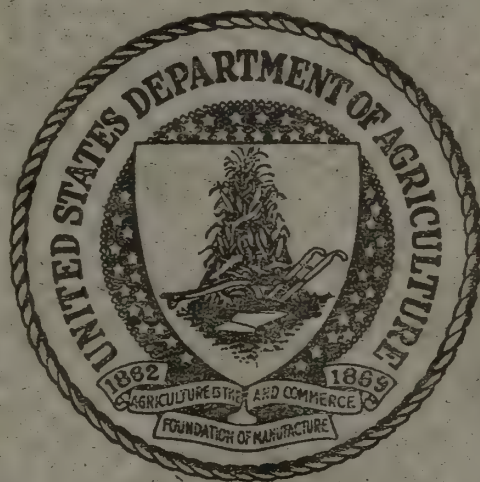
OFFICE OF EXPERIMENT STATIONS

Department of Agriculture

VOLUME 69

INDEX NUMBER

EXPERIMENT STATION RECORD



By direction of the Secretary of Agriculture, the matter contained herein
is published as administrative information required for the
proper transaction of the public business

For sale by the Superintendent of Documents, Washington, D.C. - - - - - Price 15 cents
Subscription per volume (2 volumes a year) consisting of 6 monthly numbers and index, \$1.00
Foreign subscription per volume, \$1.50

[illegible]

INDEX OF NAMES

- | | | |
|--|--|--|
| <p> Aaltonen, V. T., 370.
 Abbot, C. G., 175.
 Abbott, E. V., 535.
 Abbott, O. D., 303.
 Abe, T., 66.
 Abelein, 430.
 Abell, M. F., 445.
 Aberle, S. B. D., 36, 759.
 Abrams, M. A., 444.
 Ackerman, F. G., 622.
 Ackerman, W. T., 417, 441.
 Ackerson, C. W., 845.
 Ackert, J. E., 266, 267, 278, 543, 593.
 Adam, 587.
 Adams, F., 452.
 Adams, G. E., 912.
 Adams, J. F., 60.
 Adams, P. D., 374.
 Adams, R. L., 292, 444.
 Adams, W. L., 24, 90, 144.
 Adolph, W. H., 463.
 Adriano, F. T., 748.
 Affy, A., 799.
 Afzal, M., 794.
 Agnew, M. A., 142.
 Ahlgren, H. L., 791.
 Ahmann, C. F., 303.
 Ahrens, H. G., 246, 318.
 Aicher, L. C., 514.
 Aikman, J. M., 37.
 Ainsworth, G. C., 820.
 Aitken, H. A. A., 315.
 Akazawa, S., 421.
 Albanese, A. A., 392.
 Albert, A. R., 791.
 Alberts, H. W., 47, 157.
 Albizzati, C. M., 891.
 Albrecht, W. A., 202, 439.
 Alcock, N. L., 678.
 Alden, C. H., 390.
 Alderman, O. A., 57.
 Alderman, W. H., 659, 785, 804.
 Aldrich, J. M., 393.
 Aldrich, W. W., 801.
 Alexander, B. H., 748.
 Alexander, C. P., 386.
 Alexander, J., 323.
 Alexander, L. J., 61.
 Alexander, W. P., 122, 206.
 Alfend, S., 487.
 Alfonsus, E. C., 318.
 Alicata, J. E., 267, 268. </p> | <p> Allanson, M., 35.
 Allbaugh, L. G., 443.
 Allchorne, E., 775.
 Allen, A. L., 315.
 Allen, H., 38.
 Allen, H. R., 24, 105.
 Allen, L. A., 418.
 Allen, R. H., 442.
 Allen, T. C., 825.
 Allin, B. W., 881, 886.
 Allison, C. C., 346.
 Allison, R. V., 178, 209, 281, 516.
 Allred, C. E., 444.
 Almon, L., 791.
 Alvey, C. H., 267.
 Amanschouloff, S. A., 580.
 Amanschuloff, S. A., 579, 711.
 Ameel, D. J., 266.
 Ames, J. W., 16, 186.
 Amidon, E. P., 142.
 Amundson, G., 873.
 Ananiadès, B., 592.
 Andersen, K. T., 233.
 Anderson, A. K., 374, 417.
 Anderson, A. L., 405.
 Anderson, D. A., 505.
 Anderson, D. S., 881.
 Anderson, E., 216.
 Anderson, G. W., 115.
 Anderson, H. W., 820.
 Anderson, L. D., 77.
 Anderson, M. E., 810.
 Anderson, P. J., 518.
 Anderson, R. J., 167.
 Anderson, W. A., 140, 302.
 Anderson, W. E., 750.
 Anderssen, F. G., 450.
 Andes, E. J., 898.
 Andreev, I. E., 681.
 Andreïev, I. E., 681.
 Andres, J., 711.
 Andresen, F., 596.
 Andrews, J., 267, 278, 279.
 Andrews, J. S., 590.
 Andriés, H. E., 549.
 Andrus, C. G., 332.
 Angelo, E., 785, 804.
 Anido, F., 761.
 Anslow, G. A., 165.
 Anthony, E. L., 622.
 Anthony, R. D., 654.
 Appel, O., 372, 624, 663. </p> | <p> Arbouzoff, P. N., 580.
 Arbusoff, P. N., 579.
 Arbuzoff, N. P., 711.
 Arceneaux, G., 516.
 Archibald, J. G., 99, 705.
 Arenius, A. A., 387.
 Armsby, H. P., 162.
 Armstrong, E. F., 323.
 Armstrong, J. I., 26.
 Armstrong, S. F., 201.
 Arnason, A. P., 548.
 Arnaudi, C., 502.
 Arndt, C. H., 670.
 Arnold, C. R., 443.
 Arnold, P. T. D., 257, 258.
 Arnott, D. A., 548.
 Army, A. C., 201.
 Aronovich, N., 877.
 Arons, P., 151.
 Arthur, I. W., 126, 443.
 Ascham, L., 308.
 Asdell, S. A., 36, 90.
 Ashby, M. K., 737.
 Ashby, R. C., 94, 405.
 Ashcraft, D. W., 90.
 Asheshov, I., 489.
 Ashworth, J. T., 546.
 Ashworth, U. S., 95.
 Asmundson, V. S., 348.
 Ass, M., 234.
 Astbury, W. T., 315.
 Aszódi, Z., 327.
 Atherton, D. O., 234.
 Athrow, W., 845.
 Atkeson, F. W., 412.
 Atwater, H. W., 765.
 Aubel, C. E., 248.
 Auchinachie, D. W., 564.
 Auchter, E. C., 801.
 Augustine, D. L., 591.
 Aull, G. H., 480.
 Aull, L. E., 824.
 Austen, E. E., 391.
 Austin, J. H., 633.
 Austin, M. D., 73, 817.
 Austin, O. L., Jr., 381.
 Austin, P. R., 511.
 Austin, S. L., 206.
 Auten, J. T., 779.
 Autuori, M., 550.
 Avery, G. S., Jr., 796.
 Axtmayer, J. H., 617.
 Ayers, T. W., 386.
 Aykroyd, W. R., 469. </p> |
|--|--|--|

- Aylesworth, B. O., 319.
 Aylesworth, P. F., 130, 158, 600.
 Ayyangar, G. N. R., 29, 784.
 Ayyar, N. K., 699.
- Babcock, C. J., 705.
 Bach, W. J., 528.
 Bacharach, A. L., 631, 774, 775.
 Bachman, G. W., 267.
 Bachtell, M. A., 38, 49, 99, 116.
 Bacigalupo, J., 270.
 Bacon, S. R., 15.
 Badger, C. J., 207.
 Badger, L. F., 583.
 Bagenal, N. B., 227.
 Bagué, J., 515.
 Baier, W., 711.
 Bailey, C. H., 167, 318, 462.
 Bailey, E. M., 234, 698.
 Bailey, J. S., 652, 803.
 Bailey, L. H., 460, 504, 525.
 Bailey, M. A., 43.
 Bailey, R. M., 364.
 Bailey, S. F., 73, 826, 827.
 Bailey, W. M., 653.
 Baillon, A. F., 215.
 Bailly, J., 860, 867.
 Baird, F., 443, 604.
 Baker, A. D., 280.
 Baker, D. W., 425, 432, 494.
 Baker, E. C. S., 682.
 Baker, G. L., 3.
 Baker, H. M., 704.
 Baker, J. R., 32, 35.
 Baker, O. E., 290, 737.
 Bakke, A. L., 27, 37.
 Bakken, H. H., 881.
 Bal, D. V., 795.
 Balachowsky, A., 239.
 Balch, E. R., 548.
 Balch, R. T., 323.
 Balch, W. B., 210.
 Bald, J. G., 672.
 Baldwin, F. B., Jr., 259, 260, 706.
 Baldwin, H. I., 58, 808.
 Baldwin, I. L., 776, 791, 810.
 Ball, E. D., 238.
 Ball, N., 578.
 Ballard, E., 688.
 Ballard, J. C., 776.
 Balleau, A., 539.
 Ballinger, R. A., 288, 737.
 Ballou, F. H., 48.
 Balls, W. L., 188.
 Bally, W., 228.
 Baltzer, A. C., 101.
 Bamber, R. C., 193.
 Bamberg, R. H., 222.
 Bancroft, W. D., 324.
 Banerji, I., 794.
 Bang, O., 273.
 Banks, A., 253.
- Barackman, R. A., 460.
 Barber, G. W., 829.
 Barber, H. G., 387.
 Barbey, A., 687.
 Barger, E. H., 114.
 Barker, B. T. P., 372.
 Barker, J., 187.
 Barker, S. G., 315.
 Bärner, J., 816.
 Barnes, B. F., 205.
 Barnes, C. R., 341.
 Barnes, E. E., 38.
 Barnes, F. H., 73.
 Barnes, H., 902.
 Barnes, H. F., 320, 558.
 Barnes, O. L., 836.
 Barnett, H. M., 467.
 Barnett, R. J., 209, 210.
 Barnette, R. M., 178.
 Barnhart, J. L., 261.
 Barnum, H. J., 709.
 Barr, F., 475.
 Barr, H. T., 733, 874.
 Barre, H. W., 480.
 Barrett, L. I., 660.
 Barrett, R. E., 831.
 Barrett, R. H., 737.
 Barron, E. S. G., 170.
 Barrus, M. F., 57, 61.
 Bartell, F. E., 323.
 Barthel, C., 419.
 Bartholomew, R. P., 780, 781.
 Bartlett, J. M., 437, 477, 519, 520.
 Barto, H. T., 747.
 Bash, P. W., 350.
 Basili, R., 904.
 Bassalik, K., 188.
 Bassett, I. P., 73.
 Batchelor, H. W., 17, 513.
 Bateman, E., 380.
 Bates, G. H., 644.
 Batjer, L. P., 54.
 Baudet, E. A. R. F., 717.
 Baudisch, O., 12, 632.
 Bauer, F. C., 778.
 Baughman, W. F., 4.
 Baumann, C. A., 630.
 Baumann, E. J., 633, 773.
 Baur, F., 176.
 Bausman, R. O., 126, 443.
 Bayer, L. D., 282, 437.
 Bayfield, E. G., 38.
 Bayles, J. J., 39.
 Beach, B. A., 275, 865.
 Beach, C. L., 767.
 Beach, J. R., 863.
 Beach, T. D., 266, 267, 593.
 Beadle, G. W., 28, 783.
 Beal, J. A., 397.
 Beal, W. H., 766.
 Beall, G., 237, 387.
 Beall, H. W., 339.
 Beamers, R. H., 238.
 Bean, L. H., 443, 736.
 Bear, N. R., 116.
- Beard, P. J., 306.
 Bearse, G. E., 844.
 Beath, O. A., 421, 422.
 Beauchamp, C. E., 516.
 Beaudette, F. R., 279, 280, 435, 436, 864.
 Beaulieu, G., 557.
 Beaumont, A. B., 202, 643, 652.
 Beaumont, J. H., 655.
 Bechtel, H. E., 574.
 Beck, D. E., 395.
 Beck, H. H., 154.
 Beck, M. D., 269.
 Beck, P. G., 139.
 Beck, W. A., 25.
 Becker, C. L., 804.
 Becker, E. R., 266, 268.
 Becker, R. B., 248, 257, 258, 406, 413, 563.
 Beckett, R. E., 645.
 Beckwith, C. S., 377.
 Bedford, G. A. H., 420.
 Bee, J. W., 402, 403.
 Beers, H. W., 301.
 Beeson, W. M., 839.
 Begbie, R. S., 583.
 Beling, I., 233.
 Beling, J., 833.
 Beljavsky, A. G., 395.
 Bell, A. F., 535.
 Bell, D. S., 90, 406.
 Bell, F. G., 37.
 Bell, J. F., 911.
 Beller, K., 578, 710.
 Bender, H. L., 324.
 Bender, R. C., 418.
 Bendixen, H. A., 265.
 Bendixen, H. C., 273.
 Benedict, F. G., 142, 148, 306, 406.
 Benedict, M. R., 293, 444, 881.
 Bengis, R. O., 167.
 Bengough, G. D., 724.
 Benner, C. L., 604.
 Bennett, C. A., 439.
 Bennett, E., 643, 705.
 Bennett, F. T., 665.
 Bennett, H. H., 451, 516.
 Bennett, M. K., 452, 453, 609, 743.
 Bennett, S. C. J., 108.
 Bennett-Clark, T. A., 187.
 Bennetts, H. W., 276, 589.
 Bensin, B. M., 44.
 Bentley, R. C., 126, 131, 603.
 Benton, M. C., 620.
 Benton, R. J., 677.
 Bercaw, L. O., 133, 604.
 Berend, N., 330.
 Beresford, H., 285.
 Bergamaschi, M., 228.
 Berge, R., 717.
 Bergeim, O., 142.
 Berggren, R. E. L., 11.

- Bergman, H. F., 343, 663, 687.
 Berkeley, G. H., 537.
 Berliner, F. S., 155.
 Berne, M. D., 115.
 Bernegg, A. S. von, 28.
 Berrár, M., 579.
 Berry, J. A., 325.
 Berry, L. N., 705.
 Berry, M. H., 574.
 Bertho, J., 13.
 Bertrand, G., 755.
 Bessey, O. A., 774.
 Bethke, R. M., 90, 99, 115, 147, 152, 194, 406, 574, 839, 843.
 Betrem, J. G., 70.
 Betten, C., 158.
 Bevan, L. E. W., 714.
 Bewley, J. P., 334.
 Bewley, W. F., 226.
 Beyleveld, A. J., 450.
 Bhalerao, G. D., 431, 588.
 Bhargava, B. N., 455.
 Bianchi, A. T. J., 247.
 Bice, C. M., 698.
 Biely, J., 435.
 Biester, H. E., 110.
 Bigger, J. H., 696.
 Bijhouwer, A. P. C., 26.
 Bilger, L. N., 633, 683.
 Bing, F. C., 144, 904.
 Binkley, A. M., 473, 798.
 Binney, T. H., 104.
 Birch, T. W., 169, 471.
 Bird, E. W., 98.
 Bird, M., 516.
 Bird, O. D., 756.
 Birkhaug, K. E., 584.
 Birosel, D. M., 150.
 Bisbee, R. C., 193.
 Bisby, G. R., 184, 373.
 Bishop, F. L., 845.
 Bishopp, F. C., 82.
 Bissell, T. L., 85, 239.
 Bissonnette, T. H., 34, 641.
 Bizzell, J. A., 499.
 Blaauw, A. H., 27.
 Black, A., 698.
 Black, A. G., 126, 127, 131, 319.
 Black, J. D., 289, 296, 299, 612.
 Black, J. J., 864.
 Black, S. B., 289.
 Black, W. H., 697.
 Blackaby, J. H., 118.
 Blackfan, K. D., 144.
 Blackie, W. K., 544.
 Blackman, F. F., 187.
 Blackman, V. H., 188.
 Blackmon, G. H., 209.
 Blackwood, J. H., 851.
 Blagoweschtschensky, D. J., 558.
 Blain, D., 278.
 Blair, A. W., 24, 182.
 Blair, C. J., Jr., 912.
 Blake, M. A., 213, 368, 803, 804.
 Blakemore, F., 105.
 Blakey, H. L., 543.
 Blanck, F. C., 898.
 Blaney, H. F., 451.
 Blank, L. M., 810, 813.
 Blanton, F. S., 233, 687.
 Blasingame R. U., 440.
 Blatchley, W. S., 381.
 Blattný, C., 822.
 Blauvelt, W. E., 61.
 Bleecker, W. L., 68, 720.
 Bles, J. C., 184.
 Bleyer, B., 309.
 Blinks, L. R., 188.
 Blinks, R. D., 477.
 Bliss, C. I., 82.
 Bliss, D. E., 821.
 Bliss, E. W., 13.
 Bliss, W. K., 601.
 Blizzard, W. L., 405.
 Block, R. J., 145, 168, 617.
 Blodgett, E. C., 810.
 Blodgett, F. M., 61.
 Bloede, V. G., 323.
 Blom, T., 592.
 Blood, H. L., 224.
 Blood, P. T., 353, 502.
 Bluhm, A., 349.
 Blunck, H., 233.
 Blunt, D. L., 400, 401.
 Blystone, M. E., 176.
 Boals, G. P., 133.
 Boas Fixsen, M. A., 895.
 Bobb, M. L., 480.
 Bodenheimer, F. S., 233, 383, 550.
 Bodine, J. H., 76, 77.
 Boehmer, N., 324.
 Boelter, L. M. K., 284.
 Bogdaschew, N., 580.
 Bogolubsky (Bogolubskii), S. N., 349.
 Böhmg, r., 124.
 Bohn, 99.
 Bohstedt, G., 405, 406, 705, 839, 848.
 Boissezon, P. de, 833.
 Böker, H., 602.
 Bolas, B. D., 227.
 Bolling, G. E., 708, 709.
 Bomonti, H. F., 517.
 Bond, J. D., 206.
 Bond, L., 774.
 Bond, M. C., 137.
 Bonde, R., 372, 373.
 Bonham, E. R., 136.
 Bonnet, J. A., 516.
 Bonvicini, M., 344.
 Booher, L. E., 469.
 Booker, W. M., 696.
 Boom, B. K., 343.
 Borchert, A., 242, 838.
 Bordeleau, R., 673.
 Borden, R. J., 206, 516.
 Borggardt, A. I., 666.
 Borodaewsky, S., 443, 600.
 Borrel, A., 270.
 Borsook, H., 632.
 Borst, H. L., 38, 39, 513.
 Bose, R. D., 40, 795.
 Bose, S. S., 792.
 Bosher, J. E., 811, 823.
 Boss, A., 318.
 Boswell, V. R., 51.
 Bosworth, M. R., 746.
 Bosworth, T. J., 105.
 Botsford, H. E., 116.
 Botsford, R. C., 546.
 Bottimer, L. J., 696.
 Bottorff, C. A., 420.
 Bougher, L. C., 850.
 Boughton, I. B., 577.
 Boughton, R. V., 382.
 Boulle, L., 683.
 Bourne, A. I., 384, 652, 686.
 Bourne, B. A., 199, 221.
 Bourne, G., 903.
 Bouyoucos, G., 18.
 Bouyoucos, G. J., 323.
 Böving, A. G., 695.
 Bowden, F. P., 325, 772.
 Bowie, E. H., 332.
 Bowman, R. O., 144.
 Boyce, A. M., 833.
 Boyce, E. F., 841.
 Boyd, G. H., 266.
 Boyd, H. B., 607.
 Boyd, M. F., 392.
 Boyd, O. C., 663, 675.
 Boyd, T. A., 121.
 Boyd, W. E., 624.
 Boyd, W. L., 258.
 Boyden, R. E., 571.
 Boyer, W. C., 574.
 Boyes, K., 415.
 Bozicevich, J., 106.
 Bradfield, R., 16, 323.
 Bradford, F. C., 675.
 Bradner, M., 809.
 Braman, W. W., 414, 698.
 Brambell, F. W. R., 352.
 Brammanis, L., 233.
 Brandes, E. W., 535.
 Brandly, C. A., 249, 265, 866.
 Brandt, A., 578.
 Brann, J. W., 881.
 Brannon, L. W., 84.
 Branscheidt, P., 653.
 Bratley, H. E., 231.
 Braun, E., 318.
 Braun, E. W., 444.
 Brauner, L., 188.
 Bray, C. I., 405, 406, 408.
 Brazda, F. G., 616.
 Brdlík, V., 602.
 Breakey, E. P., 238.
 Bréaux, S. J., Jr., 45.
 Breed, R. S., 708.
 Bregger, J. T., 799.
 Bregger, T., 517, 796.

- Brehmer, W. von, 816.
 Bremer, G., 517.
 Brenchley, W. E., 650.
 Brennan, C. A., 444.
 Bressman, E. N., 346, 667.
 Brew, J. D., 708.
 Bridwell, J. C., 696.
 Brieger, F., 33.
 Brierley, P., 677.
 Brierley, W. B., 372.
 Brierley, W. G., 215, 659, 802.
 Brierly, P., 823.
 Briggs, G., 512, 621.
 Briggs, G. E., 187.
 Briggs, I. A., 251, 252.
 Brink, R. A., 29.
 Briscoe, J. M., 767.
 Britton, S. W., 197.
 Britton, W. E., 157, 231, 546, 692.
 Brizi, A., 838.
 Broadbent, F. W., 206.
 Broadfoot, W. C., 529, 666, 811.
 Broadhurst, J., 711.
 Brodshaug, M., 302.
 Brody, S., 95, 407.
 Broerman, A., 104.
 Bromley, S. W., 77.
 Brooke, M. M., 460.
 Brooker, M. A., 298.
 Brooks, A., 230, 543.
 Brooks, A. N., 221.
 Brooks, C., 68.
 Brooks, F. E., 319.
 Brooks, F. T., 63.
 Brooks, P. B., 708, 709.
 Brooks, P. R., 586.
 Brooks, W., 159.
 Brouwer, E., 755.
 Brower, A. E., 685.
 Brown, A., 464.
 Brown, A. H., 646.
 Brown, A. M., 63, 64.
 Brown, B. E., 650.
 Brown, C. M., 142.
 Brown, E. F., 262.
 Brown, F., 506, 782.
 Brown, F. J., 544.
 Brown, G. A., 700.
 Brown, H. D., 49.
 Brown, H. W., 266.
 Brown, J. G., 65, 678.
 Brown, J. M., 581.
 Brown, L. W., 848.
 Brown, P., 460.
 Brown, P. E., 16, 37, 338, 496, 515.
 Brown, P. T., 875.
 Browne, C. A., 494.
 Browne, F. L., 324.
 Browne, J. S. L., 352.
 Brownlee, A., 110.
 Brumley, O. V., 709.
 Brundage, M. R., 59.
 Brunelli, P., 273.
 Bruner, M. H., 343.
 Bruner, S. C., 387.
 Brunjes, A. S., 122.
 Brunner, E. deS., 299.
 Brunson, A. M., 232.
 Brunstad, A., 845.
 Brunton, C. E., 896.
 Bruyn, H. L. G. de, 65.
 Bryan, A. A., 37.
 Bryan, H., 201.
 Bryan, R., 122, 206.
 Bryan, W. E., 46.
 Bryant, R. C., 120.
 Bryden, W., 194.
 Bryson, H. R., 232.
 Buchanan, G. H., 323.
 Buchanan, K. S., 617.
 Buchanan, R. E., 478.
 Büchli, K., 426.
 Buchwald, K. W., 616.
 Buck, A. de, 81, 558.
 Buck, J. M., 427, 713.
 Buck, W. M., 156.
 Buckell, E. R., 548.
 Buckle, F., 230.
 Buckley, S. S., 697.
 Buckman, S., 665.
 Buhner, E. M., 681.
 Buisman, C., 379.
 Bujanda, E. M. de, 602.
 Bulkley, R., 284.
 Bullard, J. F., 430, 587, 592.
 Buller, A. H. R., 372.
 Bullis, K. L., 709.
 Bullock, F. J., 733.
 Bunyea, H., 435.
 Burdette, R. C., 686.
 Burger, H., 14.
 Burgess, A. F., 71, 385, 690.
 Burgess, I. M., 364.
 Burgess, R., 79.
 Burget, G. E., 174.
 Burgwald, L. H., 706.
 Burk, L. B., 406.
 Burkholder, W. H., 61.
 Burmeister, C. A., 697.
 Burmeister, G., 651.
 Burnett, L. C., 37.
 Burnham, C. R., 29.
 Burns, G. P., 809.
 Burns, G. R., 506.
 Burns, R. H., 786.
 Burnside, C. E., 87, 560.
 Burr, H., 443.
 Burr, W., 601.
 Burr, W. W., 621.
 Burrell, A. B., 61, 799, 800, 802, 821.
 Burt, D. R. R., 35.
 Bushnell, J., 17, 38, 647.
 Bushnell, L. D., 249, 265.
 Buswell, A. M., 324.
 Butcher, F. G., 696.
 Butler, C. G., 545.
 Butler, E. J., 373.
 Butler, O., 353, 651, 670.
 Butler, W. J., 273.
 Buxton, J. B., 105, 272.
 Buxton, P. A., 382.
 Byerly, T. C., 96.
 Bykow, W., 579.
 Caesar, L., 547, 548.
 Caffrey, D. J., 78.
 Cagle, L. R., 385.
 Cahn, A. R., 110.
 Caine, A. B., 89, 127.
 Cairns, H., 817.
 Caldwell, H. R., 230.
 Caldwell, J. C., 230.
 Caldwell, J. S., 652.
 Caldwell, M. L., 633.
 Calfee, R. K., 366.
 Calhoun, M. L., 702.
 Calhoun, P. W., 232.
 Call, L. E., 317.
 Callaway, J., Jr., 490.
 Callenbach, J. A., 825.
 Callow, R. K., 151.
 Cameron, H. C., 754.
 Cameron, R. D., 509.
 Cameron, S. H., 806.
 Cameron, T. W. M., 865.
 Camp, A. F., 57, 660.
 Camp, J. P., 199, 209.
 Campbell, F. L., 234, 242.
 Campbell, M. E., 906.
 Campbell, P. C., 600.
 Campbell, R. C., 358.
 Campbell, R. E., 84.
 Canaday, G. L., 776.
 Canham, A. S., 112, 420.
 Cannon, C. Y., 37, 98, 100, 405, 849.
 Cannon, H. J., 756.
 Canzanelli, A., 464.
 Capen, R. G., 512.
 Capper, N. S., 617.
 Card, L. E., 862.
 Carlström, B., 591, 711.
 Carmichael, E. B., 382.
 Carne, H. R., 580, 590.
 Carne, W. M., 537.
 Carnes, A., 283.
 Caron, O., 377.
 Carpano, M., 591.
 Carpenter, C. W., 535.
 Carpenter, D. C., 768.
 Carpenter, E. J., 333, 777.
 Carpenter, J. A., 393.
 Carpenter, M. F., 604.
 Carpenter, R. S., 705.
 Carr, F. H., 325.
 Carrante, V., 28.
 Carrero, J. O., 3.
 Carrick, C. W., 125.
 Carroll, J., 73.
 Carroll, W. E., 141, 881.
 Carsner, E., 818.
 Carter, D. G., 818, 874.
 Carter, R. H., 684, 824, 826.

- Carter, W., 385, 829.
 Cartwright, K. St. G., 542.
 Carver, J. S., 845.
 Carver, W. A., 199.
 Cary, A., 59.
 Cary, C. W., 386.
 Casagrande, A., 118.
 Cash, L. C., 669.
 Cashmore, W. H., 320.
 Caspersson, T., 331.
 Cassels, J. M., 296, 443.
 Castelli, T., 502.
 Castle, W. E., 195, 510, 641.
 Cathcart, C. S., 24.
 Catherwood, L., 890.
 Caulfield, W. J., 257.
 Cauthen, G. E., 266.
 Cave, H. W., 257.
 Cavert, W. L., 289.
 Cayley, N. W., 230, 388.
 Celino, M. S., 832.
 Celis, L. de, 516.
 Cernaianu, C., 582.
 Chaddock, T. T., 319.
 Chadwick, L. C., 807.
 Chakmakjian, H. H., 173.
 Chamberlain, G. C., 377.
 Chamberlin, F. S., 75, 84.
 Chamberlin, V. D., 90, 104, 570.
 Chambers, W. H., 161.
 Champion, H. G., 370.
 Chandler, A. C., 266.
 Chandler, C., 504.
 Chandler, F. B., 364, 385.
 Chandler, W. L., 106, 861.
 Chapin, E. A., 695.
 Chapman, A. B., 31.
 Chapman, A. D., 679.
 Chapman, A. G., 808.
 Chapman, P. J., 394.
 Chappellier, A., 381.
 Chardon, C. E., 515.
 Chardon, F., 516.
 Charles, E., 511.
 Charles, T. B., 406, 420, 569.
 Charlton, D. B., 262.
 Charlton, J., 17.
 Charpentier, C. A. G., 412.
 Cheatham, R. J., 514.
 Cheesman, E., 382.
 Cheesman, E. E., 29, 806.
 Chen, A. L., 382.
 Chen, H. T., 544.
 Chen, K. K., 382.
 Cherian, M. C., 399.
 Cherrington, V. A., 108, 857.
 Chesley, P., 348.
 Chester, K. S., 378.
 Chevallier, A., 630.
 Chiang Kai-Sheh, 624.
 Chibnall, A. C., 486, 487, 492.
 Child, A. M., 747.
 Childs, L., 73.
 Childs, W. H., 659.
 Chipman, R. H., 191.
 Chippindale, H. G., 782.
 Chouard, P., 823.
 Christ, J. H., 795.
 Christensen, F. W., 406, 468.
 Christensen, J. J., 222.
 Christiansen, J. E., 452.
 Christie, J. R., 670.
 Christison, M. H., 584.
 Christophersen, P., 131, 286.
 Chucka, J. A., 353, 364.
 Chupp, C., 61.
 Church, A. E., 618.
 Church, L. M., 727.
 Churchward, J. G., 191.
 Chwala, A., 323.
 Ciferri, R., 535.
 Claassen, P. W., 77.
 Clague, J. A., 633, 902.
 Clapham, P. A., 260, 272, 281.
 Clapp, S. C., 341.
 Clara, F. M., 61.
 Clarenburg, A., 434.
 Clark, A. W., 491.
 Clark, E. P., 488, 551.
 Clark, F. E., 459.
 Clark, F. H., 194.
 Clark, G. L., 323, 517.
 Clark, H. C., 583.
 Clark, H. E., 160.
 Clark, J. A., 347.
 Clark, J. H., 523.
 Clark, J. M., 728.
 Clark, N., 909.
 Clark, S. W., 384.
 Clark, T. A. B., 187.
 Clarke, H. T., 165.
 Clarke, M. K., 709.
 Clarke, W. H., 390.
 Clarke, W. S., Jr., 800.
 Claude, A., 436.
 Clausen, C. P., 246, 550.
 Clausen, R. E., 191.
 Clawson, A. B., 272.
 Claypool, L. L., 820.
 Clayton, C. F., 451.
 Clayton, E. E., 67.
 Clayton, H. H., 175.
 Clayton, W., 324.
 Cleary, P. J., 306.
 Cleaver, H. M., 885.
 Clegg, G. G., 43.
 Clement, C. E., 138.
 Clements, H. F., 342.
 Clendinnen, L. J., 230.
 Clerget, M., 876.
 Cleveland, M. M., 902.
 Clifcorn, L. E., 489.
 Cline, I. M., 332.
 Cline, L. E., 444.
 Cliza, S., 711.
 Clothier, R. C., 451.
 Clough, H. W., 775, 776.
 Clouston, D., 797.
 Clyburn, T. M., 254.
 Clyde, A. W., 440, 733.
 Coates, W. G., 444.
 Coatney, G. R., 267, 864.
 Cobbett, N. G., 394, 858.
 Cochran, L. C., 532.
 Cochran, R. L., 89.
 Coe, F. M., 368, 654.
 Coffin, M., 613.
 Coile, H. D., 327.
 Colby, H. L., 55, 658.
 Cole, A. C., Jr., 230.
 Cole, F. R., 829.
 Cole, J. S., 650.
 Cole, L. J., 348.
 Cole, W. C., 419.
 Cole, W. R., 652.
 Coleman, D. A., 461.
 Coles, J. D. W. A., 114, 420.
 Collier, G. A., 610, 650.
 Collier, G. W., 881.
 Collins, C. W., 78.
 Collins, E. V., 71, 98, 438.
 Collins, J. L., 786.
 Collins, W. D., 117.
 Collip, J. B., 350.
 Collison, R. C., 367.
 Colón, I. A., 516.
 Colvin, E. M., 455, 603.
 Combs, O. B., 798.
 Combs, W. B., 259, 260, 706.
 Comin, D., 38, 49.
 Common, R. H., 570.
 Commons, J. R., 448.
 Comstock, L., 149, 150.
 Conant, R., 206.
 Conn, H. J., 160.
 Connell, W. E., 248, 407, 701.
 Connors, C. H., 807.
 Conrey, G. W., 16.
 Conroy, C. C., 332.
 Conser, C. C., 444.
 Cook, A. C., 405.
 Cook, D. H., 617.
 Cook, H. T., 224, 678.
 Cook, J. W., 352.
 Cook, M. T., 534, 535, 909.
 Cook, O. F., 645.
 Cook, W. H., 797.
 Cooke, D. A., 206.
 Cooke, M. L., 728.
 Cookson, I. C., 541.
 Cooley, J. S., 55.
 Cooley, R. A., 247.
 Coolidge, J. H., 600.
 Coolidge, T. B., 632.
 Coon, B. I., 142.
 Coons, G. H., 67.
 Cooper, C., 681.
 Cooper, H., 583.
 Copeland, J. T., 874.
 Copeland, O. C., 100.
 Copland, D. B., 290.
 Corbett, G. H., 78, 549.
 Corbett, W., 226.
 Corbin, C. I., 709.
 Cordonnier, 753.

- Cordy, C., 36, 47.
 Corey, E. L., 197.
 Cornell, F. D., Jr., 440.
 Corner, G. W., 196.
 Cory, E. N., 80.
 Cory, H. E., 473.
 Costanzo, G., 604.
 Cotter, R. U., 63.
 Cotton, W. E., 427, 713.
 Cottrell-Dormer, W., 535.
 Couch, J. N., 372.
 Coulpier, I., 736.
 Coult, M., 446.
 Coulter, J. M., 341.
 Countryman, M. C., 674.
 Coward, K. H., 310, 630, 631.
 Cowden, T. K., 742.
 Cowell, S. J., 753.
 Cowgill, G. R., 168, 303, 750.
 Cowgill, H. B., 517.
 Cowles, H. C., 341.
 Cowles, M. L., 613, 889, 908.
 Cox, E. G., 10, 11.
 Cox, R., 457.
 Cox, R. F., 249, 701.
 Cox, R. W., 442, 600.
 Craft, W. A., 348.
 Crafts, A. S., 520.
 Craig, C. F., 709.
 Craig, E. L., 381.
 Craig, N., 516.
 Craig, R. S., 709.
 Craigie, J. H., 372.
 Cram, E. B., 268.
 Crampton, E. W., 840.
 Crane, D. B., 423.
 Crane, M. B., 523.
 Crans, L., 446.
 Crawford, A. B., 719.
 Crawford, C. H., 99.
 Crawford, L. A., 292.
 Crawford, R. F., 828.
 Creech, G. T., 276, 715.
 Crenshaw, J. H., 55.
 Cressman, A. W., 73, 690.
 Crew, F. A. E., 35, 196, 197, 510.
 Criddle, N., 553.
 Cripps, A., 600.
 Crist, J. W., 786.
 Crosier, W. F., 61.
 Cross, F., 109.
 Cross, H., 120.
 Crowder, J. A., 167.
 Crowley, D. J., 215.
 Crown, R. M., 199.
 Crowther, C., 409.
 Crowther, F., 43.
 Cruess, W. V., 26, 52.
 Crumb, S. E., 75.
 Cruz Monclova, H. E., 517.
 Csonka, F. A., 4, 165.
 Cubbon, M. H., 635.
 Culbertson, C. C., 89, 93, 405, 406, 565.
 Cullinan, F. P., 656.
 Culpepper, C. W., 366.
 Cumings, G. A., 359.
 Cummings, M. B., 805.
 Cunningham, L. C., 127.
 Cupples, H. L., 75.
 Curasson, G., 424.
 Curie, I. H., 513.
 Curini-Galletti, A., 673.
 Curson, H. H., 420.
 Curtis, H. E., 24.
 Curtis, L. C., 157.
 Curtiss, C. F., 158.
 Curtze, W., 711.
 Cushing, G., 844.
 Cushman, R. A., 561.
 Cutler, D. W., 734.
 Cutler, J. S., 38, 116.
 Cutright, C. R., 72, 232, 240, 241.
 Cutright P. R., 35.
 Cutshall C. S., 119.
 Cuvillier, E., 268.
 Cyrus, C. H., 289.
 Cytovich, M. V., 33.
 Czarnetzky, E. J., 166.
 Daane, A., 199, 248.
 Dabral, B. M., 189.
 Dadisman, A. J., 886.
 Dadswell, H. E., 661.
 Dahlberg, A. C., 707, 708.
 Dahle, C. D., 707.
 Dakin, H. D., 484.
 Dale, C. N., 714.
 Dalling, T., 588.
 Dalmatoff, M., 710.
 Dalmer, O., 9.
 Damodaran, M., 492.
 D'Amour, F. E., 34, 643.
 Dana, B. F., 532.
 Dana, H. J., 317, 880.
 Danforth, C. H., 788.
 Dangoumau, A., 168.
 Daniels, L. B., 835.
 Daniels, W. W., 161.
 Dann, B., 355.
 Dann, W. J., 10, 471.
 Danner, B. G., 621.
 Darby, H. H., 634.
 Darling, F. F., 33.
 Darlow, A. E., 406.
 Darnell, M. C., 643.
 Darrow, G. M., 56, 659.
 Darrow, W. H., 768.
 Dastur, J. F., 534, 535.
 Dastur, R. H., 796.
 Datta, S. C. A., 583, 860.
 Daubney, R., 590.
 Daugherty, M. M., 126, 889.
 Dave, C. N., 705.
 Davenport, E., 163, 164.
 Davey, V. McM., 649.
 Daviault, L., 547.
 David, W., 710.
 Davidson, J., 363.
 Davidson, J. B., 116, 127, 597.
 Davidson, O. W., 207.
 Davies, G. O., 596.
 Davies, J. G., 517.
 Davies, W. M., 238.
 Davis, C. L., 587, 868.
 Davis, G. E., 176, 177, 712, 869.
 Davis, G. N., 60.
 Davis, H. A., 504.
 Davis, J. H., 685.
 Davis, J. J., 70.
 Davis, J. S., 295, 443, 883.
 Davis, L. D., 658.
 Davis, R. L., 38, 49, 517, 534.
 Davis, W. C., 793.
 Davis, W. H., 663.
 Dawsey, L. H., 12, 685.
 Dawson, C. R., 257.
 Dawson, J. R., 413.
 Day, P. L., 155.
 Day, R. K., 371.
 D'Costa, J., 868.
 Dean, A. L., 90.
 Dean, F. P., 546.
 Dean, F. W., 57.
 Dean, G. A., 232.
 Dean, R. W., 824.
 Dearborn, N., 381.
 Dearness, J., 821.
 Dearstyne, R. S., 94.
 de Boissezon P., 833.
 Débonéra, G., 590, 595.
 de Bruyn, H. L. G., 65.
 de Buck, A., 81, 558.
 de Bujanda, E. M., 602.
 de Celis, L., 516.
 Decker, G. C., 389.
 DeEds, F., 73.
 Deemer, R. B., 493, 516.
 Deen, J. L., 343, 371.
 Deerr, N., 518.
 de Gryse, J. J., 547.
 Dehus, D., 508.
 Deighton, T., 566.
 de Jesus, P. I., 392.
 de Jesus, Z., 590.
 de Kock, G., 421.
 Delaplane, J. P., 435, 863.
 Delbé, P., 111.
 Delez, A. L., 718.
 DeLong, D. M., 72.
 Delwiche, E. J., 791, 798, 810.
 Demaree, J. B., 823.
 Dembo, L. H., 305.
 Demoussy, E., 188.
 Dempsey, P. W., 652.
 Dencker, C. H., 875.
 Den Haan, J. J. W., 517.

- Denham, W. S., 315.
 Denison, F. N., 176.
 Deniston, A. J., Jr., 287.
 Dennis, E. W., 697.
 Dennis, W. V., 614.
 Dennison, M., 351.
 DenUyl, D., 371.
 Derbigny, I. A., 472.
 Derick, R. A., 360.
 De' Rossi, G., 500.
 Derrick, C., 451.
 de Ruyter de Wildt, J. C., 755.
 Deshpande, R. B., 639.
 Deslarzes, J., 612.
 des Ligneris, M. J. A., 115.
 de Swardt, S. J., 450.
 Detjen, L. R., 48, 365.
 DeTurk, E. E., 40, 778.
 Deuber, C. G., 507.
 DeVault, S. H., 129, 446.
 Devereux, E. D., 102, 103, 416, 573.
 DeVolt, H. M., 864.
 Dewey, E. T., 271.
 de Wildt, J. C. de R., 755.
 Dexter, S. T., 638.
 Deysher, E. F., 260.
 Dibble, C. B., 581, 685, 832.
 Dick, H., 8.
 Dickins, D., 622.
 Dickinson, E., 315.
 Dickinson, L. S., 643.
 Dickinson, S., 372, 527.
 Dickison, W., 547.
 Dickmans, G., 268.
 Dickson, F., 61.
 Dickson, J. G., 62, 372, 667, 810, 811, 839.
 Dickson, M. A., 465.
 Dickson, W. F., 509, 842.
 Diddens, H., 65.
 Diernhofer, K., 579, 580.
 Dietz, H. F., 240, 384.
 Dietz, S. M., 60.
 Digges, J. G., 836.
 Dikmans, G., 426, 582, 500, 711, 866.
 Dillon, R. T., 166.
 Dimock, W. W., 111, 434.
 Dinsmore, W., 405.
 Dippenaar, B. J., 540.
 Dirks, C. O., 244.
 Disterdick, F. L., 332.
 Ditman, L. P., 80.
 Dixit, P. D., 191, 192.
 Dixon, H. H., 188.
 Dixon, J. S., 681.
 Doan, C. A., 271.
 Doan, F. J., 851.
 Doane, D. H., 443.
 Dobell, C., 545.
 Dobrosky, I. D., 386.
 Dobrovolskaia - Zavadskaia, N., 510, 788.
 Doby, G., 188.
 Dodds, E. C., 352.
 Dodds, H. H., 515, 517.
 Dodge, B. O., 69, 372.
 Dodov (Dodoff), D. N., 534.
 Dodson, W. R., 519.
 Doebbeling, S. E., 633.
 Doelter, C., 323.
 Doerr, R., 594, 595.
 Doisy, E. A., 484.
 Doktorsky, A., 762.
 Doldi, S., 185.
 D'Ombraín, E. A., 230.
 Domínguez, F. A. L., 515, 516, 517, 909.
 Domm, L. V., 197.
 Donaldson, R. W., 663.
 Donat, F., 425.
 Donatien, A., 587.
 Donelson, E., 751.
 Donham, C. R., 107, 273, 318, 585, 856.
 Dooley, P., 270.
 Dopp, E., Jr., 535.
 Doran, W. L., 663.
 Dorcas, M. J., 154.
 Dorman, R., 385.
 Dorofejew, A. A., 710.
 Dorrance, A. B., 572.
 Dorsey, M. J., 657.
 Dossall, L., 222.
 Doten, S. B., 158.
 Douglass, E., 839.
 Douglass, J. R., 559, 834.
 Doult, M. T., 51.
 Dove, W. E., 243, 267.
 Dove, W. F., 410.
 Dow, G. F., 445.
 Dowd, L. R., 851.
 Dowden, P. B., 833.
 Down, P. A., 264.
 Doyle, C. B., 645.
 Doyle, L. P., 860.
 Doyle, T. M., 432, 711.
 Doyne, H. C., 335.
 Dozier, H. L., 72.
 Drabkin, D. L., 633.
 Drachev, S. M., 18.
 Draghetti, A., 64.
 Drain, B. D., 53, 647.
 Draize, J. H., 421, 422.
 Drake, C. J., 71, 72, 828.
 Draxler, J. H., 881.
 Drayton, F. L., 61.
 Dremjatsky, 578.
 Dressel, A., 663.
 Dressel, K., 526.
 Driggers, B. F., 390.
 Drummond, J. C., 150, 151, 320, 465.
 Duckham, A. N., 610.
 Ducros, E., 160.
 Duddy, E. A., 609.
 Duff, H. M., 433.
 Dufrénoy, J., 226, 372.
 Dugas, A. L., 80, 81, 836.
 Duggar, B. M., 526.
 Duke, H. L., 596.
 Dummeier, E. F., 444.
 Dumont, C., 643.
 Duncan, J. R., 513.
 Duncan, O. D., 288, 614.
 Dungal, N., 109.
 Dunkle, P. B., 43.
 Dunlap, F., 601.
 Dunlap, M. E., 120.
 Dunlavy, H., 43, 532.
 Dunn, L. H., 583, 592, 712.
 Dunn, S., 365, 638.
 Dunning, D., 59.
 Dunning, R. G., 805.
 Dunton, H. L., 158.
 du Pasquier, R., 822.
 du Plessis, A. F., 450.
 Dustan, A. G., 387, 547, 548.
 du Toit, F. J., 450.
 du Toit, F. M., 450.
 du Toit, P. J., 107, 420.
 Dutt, A., 761.
 Dutt, N. L., 785.
 Dutton, W. C., 68, 520.
 du Vigneaud, V., 146.
 du Vigneaud, Z., 146.
 Dyer, E., 12, 632.
 Dyer, F. J., 630.
 Dyer, R. E., 400.
 Dykstra, R. R., 265.
 Eagles, B. A., 263, 264.
 Eagles, G. H., 865.
 Earp, K., 315.
 East, E. M., 639.
 Eastham, A., 208.
 Eastman, M. G., 767.
 Ebeling, W., 77, 829.
 Ebling, W. H., 881.
 Ecker, E. E., 870.
 Ecker, J. E., 87.
 Eckles, C. H., 258, 850.
 Eddins, A. H., 221, 223, 669.
 Eddy, W. H., 148, 619, 890, 897.
 Eden, T., 36.
 Edgar, G., 580.
 Edgar, R., 475.
 Edgerton, C. W., 535.
 Edgington, B. H., 104, 843.
 Edmonds, J. L., 141, 405.
 Edwards, A. C., 651.
 Edwards, D. W., 633, 643, 652, 793.
 Edwards, F. R., 405, 464.
 Edwards, J., 573.
 Edwards, P. R., 111, 424, 434, 714.
 Eekelen, M. van, 324.
 Eggert, C., 463.
 Ehrlich, C., 426.
 Eiman, J., 154.
 Eisenmenger, W. S., 207, 643.
 Eke, P. A., 293, 444.
 Ekko, P., 602.
 Eklund, E. E., 332.
 Elcock, H. A., 362.

- Eliason, O. L., 437.
 Eliescu, G., 233.
 Elledge, H. G., 324.
 Ellenwood, C. W., 48, 874.
 Ellington, G. W., 390.
 Elliott, H. G., 537.
 Elliott, H. S., 116.
 Elliott, K. A. C., 485.
 Ellis, L. S., 288, 448, 737, 740.
 Ellis, N. R., 96.
 Ellis, R. V., 318.
 Ellison, E. T., 197.
 Ellison, J. B., 151.
 Ellison, J. M., 480.
 Elöd, E., 315.
 Elst, P. van der, 225.
 Elton, C., 712.
 Eltringham, H., 545.
 Elvehjem, C. A., 258, 753, 839, 844, 890.
 El Zoheiry, M. S., 688.
 Embleton, H., 701.
 Emerson, J. L., 216.
 Emerson, W. R. P., 306.
 Emery, F. E., 350.
 Emmel, M. W., 279.
 Emmerie, A., 324, 773.
 Emmett, A. D., 756.
 Endô, S., 68, 664.
 Engberg, C. A., 491.
 Engelbrecht, M. A., 855.
 England, C. W., 911.
 Enlow, C. R., 644.
 Enquist, F., 14.
 Ensign, M. R., 50, 175, 199, 209.
 Enzmann, E. V., 196, 642.
 Eppson, H. F., 421, 422.
 Erb, J. H., 102.
 Erben, F., 900.
 Erdman, H. H., 881.
 Erf, L. A., 708.
 Ericksson, J., 219.
 Erikson, S. E., 571.
 Erlanson, E. W., 347.
 Errington, P. L., 682, 824.
 Erwin, A. T., 37, 48.
 Esaki, T., 386.
 Eshbaugh, F. P., 210.
 Eskedal, H. W., 257.
 Esmarch, F., 816.
 Espe, D. L., 98, 100, 405.
 Essex, H. E., 437, 863.
 Essig, E. O., 685, 826, 836.
 Estes, H. R., 709.
 Estradère, (Mille.), 730.
 Etchells, J. L., 573.
 Etcheverry, B. A., 720.
 Euler, H. von, 150, 151, 466, 467.
 Evanoff, M., 271.
 Evans, E. K., 616.
 Evans, G., 644.
 Evans, H. M., 464, 468, 511.
 Evans, H. O., 387.
 Evans, J. W., 553.
 Evans, M. M., 65, 678.
 Evans, R. F., 255, 403, 566, 567.
 Evans, U. R., 323.
 Evans, W. S., 327.
 Eveleth, M. W., 904.
 Everitt, E. L., 374.
 Evreinov (Evreinow), M., 287, 879.
 Evvard, J. M., 406, 565.
 Ewan, J. W., 531.
 Ewbank, E. K., 320.
 Ewing, H. E., 266.
 Eyer, J. R., 230, 828.
 Eyles, C. M. E., 310.
 Eyre, F. H., 217.
 Ezekiel, W. N., 528, 532, 536, 541.
 Fabian, F. W., 494.
 Fagan, F. N., 802.
 Fagan, T. W., 644.
 Fahmy, T., 65.
 Fahringer, J., 233.
 Fairbanks, F. L., 116, 124.
 Fairman, S., 119.
 Falconer, J. G., 339.
 Falconer, J. I., 127, 128, 600, 880.
 Falkowski, L., 521.
 Fargher, R. G., 373.
 Fargo, J. M., 839.
 Farleman, M. G., 833.
 Farley, D. L., 709.
 Farley, F. L., 230.
 Farley, H., 265.
 Farmer, C. J., 473.
 Farmer, R. S., 103.
 Farnell, R. G. W., 517.
 Farnsworth, H. C., 452, 743.
 Farr, W. K., 357.
 Farrar, M. D., 241, 385.
 Farrell, F. D., 601.
 Farrer, R., 524.
 Faulkner, J. M., 581.
 Faull, J. H., 380.
 Faure, J. C., 687.
 Faurot, F. W., 621, 654.
 Faust, E. C., 243, 869.
 Faustino, L. A., 303.
 Favorov, F., 320.
 Fawcett, H. S., 372, 540, 821.
 Fay, A. C., 257.
 Feese, D. M., 46, 319.
 Fehér, D., 23.
 Feldman, W. H., 595.
 Fellers, C. R., 142, 309, 633, 747, 890, 902, 903.
 Felt, E. P., 72, 76, 232, 385, 693.
 Feng, L. C., 589.
 Fenstermacher, R., 431.
 Fenton, F. C., 281, 597, 733.
 Ferguson, W. S., 250, 251.
 Fernández García, R., 516, 624.
 Ferrari, E., 610.
 Ferrière, C., 561.
 Ferrin, E. F., 405.
 Fevold, H. L., 198, 350, 642.
 Ficht, G. A., 832.
 Field, A., 757.
 Field, A. M., 748, 892.
 Fikry, M. A., 344.
 Filinger, G. A., 209, 212.
 Finch, A. H., 379.
 Findlay, G. M., 712.
 Findlay, W. P. K., 542.
 Finlay, W., 851.
 Finnell, H. H., 45, 205, 514, 790.
 Fischer, K. R., 233.
 Fisher, D. F., 652.
 Fisher, E., 475.
 Fisher, G. W., 206.
 Fisher, H. J., 234.
 Fisher, R. C., 551.
 Fisher, S. J., 90.
 Fiske, J. G., 363.
 Fitch, C. P., 107, 258, 273, 318, 585, 856.
 Fitch, J. B., 257.
 Fite, A. B., 799.
 Fixsen, M. A. B., 895.
 Flanders, S. E., 232.
 Flanley, M. G., 615.
 Flemion, F., 26, 188, 189.
 Fleshman, C. L., 574.
 Fletcher, F. W., 683, 824.
 Fletcher, L. A., 801.
 Fletcher, P. L., 884.
 Fletcher, T. B., 392.
 Flexner S., 262.
 Flint, O. S., 709.
 Flint, W. P., 241, 385.
 Fluke, C. L., 233, 825, 830.
 Foëx, E., 226.
 Fogden, E. W., 847.
 Fohrman, M. H., 414, 705.
 Folin, O., 172.
 Folkers, E. C., 707.
 Folley, S. J., 484.
 Folsom, D., 372, 373.
 Fong, H. D., 606.
 Fonseca, J. P., da, 550.
 Foord, J. A., 737.
 Forbes, E. B., 405., 406, 413, 414, 698.
 Ford, M. C., 21, 181.
 Forman, J., 897.
 Formosof, A. N., 543.
 Forrester, D. R., 480.
 Forsling, C. L., 444.
 Forstall, A. E., 765.
 Fortier, S., 769, 770.
 Foscue, E. J., 176, 177.
 Foster, G. A. R., 43.
 Foster, J. E., 843, 859.
 Foster, L., 479.
 Foster, M. L., 165.

- Foster, M. T., 564.
 Foster, R. E., 560.
 Foster, W. R., 821.
 Foulger, J. H., 314.
 Foulkrod, G. M., 911.
 Fowler, H. C., 882.
 Fox, F. W., 900.
 Fox, H. M., 694.
 Fracchia, V. G., 273.
 Fraenkel, G., 383.
 France, R. L., 633, 712, 736.
 Francioni, J. B., Jr., 408.
 Francis, H. R., 445.
 Frandsen, J. H., 705.
 Frank, A., 757.
 Frank, L. C., 708.
 Frankenfeld, J. C., 830, 836.
 Franklin, H. J., 652, 687.
 Franklin, M. C., 105.
 Fransen, J. J., 245.
 Franssen, C. J. H., 241, 553.
 Franzke, C. J., 532.
 Fraps, G. S., 95, 100, 328, 418.
 Fraser, A. H. H., 320, 564.
 Frasier, F. W., 845.
 Frear, D. E., 698.
 Fred, E. B., 166, 183, 771, 776.
 Freeborn, S. B., 267.
 Freeman, V. A., 405, 567.
 Freese, W., 579.
 Freitag, J. H., 677.
 French, A. P., 652, 803.
 French, M. H., 403.
 Frey, C. N., 259, 324.
 Friant, R. M., 142.
 Friederichs, H. F., 233.
 Friederichs, K., 233.
 Friedman, H., 350.
 Friend, J. N., 323.
 Friend, M. R., 303.
 Friend, R. B., 80, 84, 399.
 Friend, W. H., 369.
 Frobisher, M., Jr., 711.
 Froehner, R., 579.
 Froker, R. K., 881.
 Frolik, A. L., 28.
 Fromme, F. D., 480.
 Frost, F. M., 267.
 Frost, S. W., 236.
 Frost, W. D., 274, 429, 586, 855.
 Frundianescu, A., 602.
 Fry, E. G., 172.
 Fry, W. H., 15.
 Frye, W. W., 266.
 Fudge, B. R., 221.
 Fudge, J. F., 328, 528.
 Fuertes, L. A., 230.
 Fuhrmann, J., 545.
 Fukushi, T., 70, 819.
 Fukushima, T., 421.
 Fullaway, D. T., 385, 548.
 Fullaway, S. V., Jr., 809.
 Fuller, A. H., 875.
 Fuller, F. D., 90.
 Fuller, G. D., 341.
 Fuller, G. L., 777.
 Fuller, J. E., 502, 635, 712.
 Fuller, J. G., 848.
 Fuller, N. M., 117.
 Fullilove, W. T., 605.
 Fulmer, E. I., 327.
 Fulmer, H. L., 703.
 Fulton, B. B., 232.
 Fulton, B. F., 43.
 Fulton, J. S., 432.
 Funnell, E. H., 749.
 Funtikow, G., 234.
 Furry, M. S., 764.
 Furukawa, K., 690.
 Fyleman, E., 170.
 Gabriel, H. S., 126.
 Gadd, C. H., 540.
 Gaddum, L. W., 57, 209, 303.
 Gaessler, W. G., 37.
 Gahan, A. B., 247, 398.
 Gahn, B. W., 651.
 Gaiger, S. H., 596.
 Gaines, E. F., 639.
 Gaines, J. C., 76.
 Gaines, J. G., 67.
 Gallagher, H. J., 123.
 Galletti, A. C., 673.
 Galli, P., 804.
 Gallo, F., 270.
 Galloway, L. D., 373, 374.
 Gamble, J. A., 697.
 Gambrell, F. L., 385.
 Ganguli, P. M., 30, 795.
 Gans, A. R., 127, 571.
 Garber, R. J., 198.
 Garcia, F., 318.
 Garcia, R. F., 516, 624.
 Gardiner, M. L., 426.
 Gardner, H. A., 324.
 Gardner, R., 328.
 Gardner, V. R., 158, 621, 786.
 Gardner, W., 437.
 Garey, L. F., 442.
 Garman, P., 246, 384, 546.
 Garnett, W. E., 480.
 Garton, F. L., 730.
 Garver, H. L., 880.
 Gaskill, E. F., 643.
 Gasow, H., 393.
 Gaston, H. P., 743.
 Gates, W. H., 641.
 Gaudineau, M., 668.
 Gault, L., 24.
 Gäumann, E. A., 372.
 Gaumnitz, E. W., 705.
 Gaylord, F. C., 885.
 Gee, W., 140.
 Geib, H. V., 721.
 Geiger, M., 514.
 Geiger, R., 233, 495.
 Gelpi, A. J., Jr., 416.
 Georgi, C. D. V., 75.
 Georgievics, G., 324.
 Geraghty, G. B., 763.
 Gerlaugh, P., 405.
 Germain, L., 848.
 Gersdorff, C. E. F., 387.
 Gersdorff, W. A., 234.
 Geweniger, 719.
 Ghosh, S., 761.
 Gibbs, C. S., 424, 709, 861, 862.
 Giblett, M. A., 176.
 Giblin, L. F., 290.
 Gibson, A., 547.
 Gibson, R. E., 786.
 Giese, H., 37, 48, 289, 442.
 Gieseke, L. F., 778.
 Gilbert, B. E., 183, 318, 912.
 Gilchrist, F., 642.
 Gildow, E. M., 108.
 Gill, D. A., 427, 586, 858.
 Gill, D. L., 61.
 Gillett, L. H., 894.
 Gillette, C. P., 478.
 Gilliatt, F. C., 547.
 Gilligan, G. M., 16.
 Gilman, H. L., 713.
 Gilman, J. C., 28, 811.
 Gilmer, P. M., 232, 240, 831.
 Gilmore, H., 384.
 Gilmore, J. U., 78.
 Gingrich, W., 267.
 Ginsburg, J. M., 74, 383, 684.
 Gioelli, F., 664, 676.
 Girard, J. W., 809.
 Girg, N. H., 579.
 Giršavičius, J. O., 485.
 Gist, R. H., 480.
 Givan, C. V., 452.
 Glaser, R. W., 266.
 Glasgow, H., 245.
 Glen, R., 695.
 Glennie, A. E., 890.
 Gleria, J. di, 323.
 Glick, D., 168.
 Glover, P. M., 384.
 Glover, R. E., 105, 112.
 Gloyer, W. O., 377.
 Godbey, E. G., 254.
 Goettsch, M., 719.
 Goff, C. C., 231.
 Goff, R. A., 793.
 Goggin, K., 285.
 Gold, B., 892.
 Gold, E., 595.
 Goldblatt, H., 467, 474.
 Golding, F. D., 238.
 Goldthwaite, G. E., 728.
 Goma, T., 151.
 Gomez, E. T., 349.
 Gonggrijp, I. H., 76.
 Gonggrijp (Gonggryp), J. W., 247.
 Gonzaga, A. C., 715.
 Good, E. S., 405.
 Good, N. E., 395.
 Goodale, B. E., 854.
 Goodale, H. D., 193.

- Gooden, E. L., 234.
 Goodhue, L. D., 327.
 Goodman, A. M., 116.
 Goodpasture, E. W., 269.
 Goodspeed, T. H., 191.
 Goodwin, J., 328.
 Goodwin, W., 219, 227, 372, 821.
 Gordon, B., 901.
 Gordon, H. H., 386.
 Gordon, W. S., 110, 590.
 Gore, U. R., 357.
 Gorham, R. P., 547.
 Gormel, B. O., 90.
 Gorrie, R. M., 218.
 Gortner, R. A., 318, 323, 483.
 Goseco, F., 534.
 Goss, H., 509, 787.
 Goss, M. J., 494.
 Goto, Y. B., 778, 806.
 Gough, G. A. C., 487.
 Gould, C. H., 384.
 Goulden, C. H., 222.
 Gourley, J. H., 21, 48, 213.
 Gousseff, W. F., 545.
 Gowen, J. W., 347.
 Graber, L. F., 791.
 Grace, J. D., 475.
 Graetz, D., 352.
 Graf, D. W., 730.
 Graf, H., 421, 578, 710.
 Graham, C. E., 469, 899.
 Graham, N. P., 430.
 Graham, R., 108, 115, 277, 280, 405, 426, 431, 435, 585.
 Grainger, J., 673, 819.
 Grams, W. T., 90.
 Grange, W. B., 543.
 Granovsky, A. A., 245, 388.
 Grant, H. C., 605.
 Grant, R. L., 10.
 Grassnickel, W., 710.
 Gratz, L. O., 199, 221.
 Gratzl, E., 579.
 Graul, E. J., 791.
 Graves, A. H., 679.
 Graves, H. S., 370.
 Graves, M., 601.
 Graves, R. R., 30, 413, 414.
 Gray, L. C., 448, 451, 601.
 Gray, P. A., 905.
 Gray, P. H. H., 495.
 Gray, R. B., 729.
 Gray, R. W., 332.
 Greaney, F. J., 222.
 Greaves, C., 727.
 Green, R. G., 271.
 Green, R. M., 443.
 Green, T. C., 17.
 Green, W. J., 288.
 Greene, H. C., 771.
 Greene, L., 49.
 Greene, M. R., 149.
 Greene, P. S., 462, 477.
 Greenhill, A. W., 782.
 Greenstein, J. P., 5.
 Greenwood, D. A., 620.
 Gregor, J. W., 637.
 Gregory, F. G., 43, 188.
 Gregory, P. W., 509, 787.
 Gresson, R. A. R., 350.
 Grest, E. G., 286.
 Grether, E. T., 457.
 Grew, E. S., 435.
 Grewe, E., 460.
 Grey, C. G., 276.
 Griem, W. B., 489.
 Griffee, F., 477.
 Griffith, A. S., 105.
 Griffith, E., 562.
 Griffith, G., 403.
 Griffith, M., 156.
 Griffith, W. H., 469, 899.
 Griffiths, H. N., 759.
 Grigg, E., 457.
 Griggs, M. A., 324.
 Griggs, R. F., 336.
 Grimes, M. A., 316.
 Grimminger, G., 176.
 Griswold, D. J., 406.
 Griswold, G. H., 237, 692.
 Groat, W. A., 315.
 Groebbels, F., 381.
 Grossmann, H., 560.
 Gross, E. R., 287, 599.
 Gross, I. H., 746.
 Gross, J., 155, 259.
 Grossheim, N. A., 233.
 Grossman, E. F., 232.
 Grover, H. F., 466.
 Groves, A. B., 480.
 Grunder, M. S., 354.
 Gruse, W. A., 121.
 Grynberg, M. Z., 174.
 Gryse, J. J. de, 547.
 Guba, E. F., 220, 663.
 Gui, H. L., 72, 547, 558, 693.
 Guin, M., 291.
 Guise, C. H., 370.
 Gullickson, T. W., 258.
 Gunn, K. C., 814.
 Gunness, C. I., 177, 332, 652, 734, 737.
 Gunns, C. A., 255.
 Gurin, C. Z., 619.
 Güssow, H. T., 222, 536.
 Gustafson, F., 583.
 Gustavson, R. G., 34, 643.
 Guterman, C. E. F., 61.
 Guthrie, J. D., 507.
 Gutfeld, M., 612.
 Guyatt, B. L., 473.
 Györgyi, A. S., 7, 11.
 Haag, J. R., 252.
 Haan, J. J. W. Den, 517.
 Haas, A. J., Jr., 12.
 Haas, A. R. C., 540, 541.
 Haasis, F. A., 61.
 Haber, E. S., 48, 148.
 Hackbarth, J., 521.
 Hackedorn, H., 406.
 Haddock, J. L., 643.
 Hadley, C. H., 386.
 Hadley, F. B., 274, 429, 586, 848, 865.
 Hadley, P., 711.
 Hafekost, G., 522.
 Hagan, H. R., 822.
 Hagan, W. A., 90, 273, 276, 428.
 Haggard, A., 797.
 Haglund, E., 419.
 Hahn, F. V. v., 630.
 Hahn, G. G., 378.
 Haig, I. T., 660.
 Haigh, L. D., 187.
 Haines, R. T. M., 465.
 Haines, W. E., 356.
 Haldane, J. B. S., 190, 193, 344.
 Hale, F., 701.
 Hale, G. A., 646.
 Hale, R. W., 410.
 Hall, A. D., 523.
 Hall, D. G., 243, 266, 267.
 Hall, H. G., 789, 909.
 Hall, J. L., 248.
 Hall, L., 474.
 Hall, M. C., 111.
 Hall, P. R., 266.
 Hall, R. A., 43.
 Hall, W. C., 407.
 Haller, H. S., 117.
 Haller, M. H., 54.
 Halliday, N., 152.
 Halligan, C. P., 216.
 Hallman, E. T., 856.
 Hallock, H. C., 83.
 Halperin, M., 645.
 Halpin, J. G., 839, 865.
 Halswick, A. H., 579.
 Halvorsen, W. V., 857.
 Halvorson, H. A., 762.
 Halvorson, H. O., 6.
 Ham, C. W., 120.
 Hamann, E. E., 718.
 Hamilton, A. B., 129.
 Hamilton, C. C., 688, 807.
 Hamilton, H. G., 298.
 Hamilton, T. S., 406, 700.
 Hamlin, F. H., 733.
 Hammar, C. H., 601, 739.
 Hammer, B. W., 98, 103, 416, 574, 575.
 Hammer, O. H., 246.
 Hammond, W. E., 93, 406.
 Hampson, C. C., 453.
 Hampson, C. M., 286.
 Hance, F. E., 206.
 Hand, I. F., 332, 776.
 Hanes, C. S., 187.
 Hanke, M. E., 171.
 Hankins, O. G., 406, 697.
 Hanna, W. F., 165, 811.
 Hannay, A. M., 446.
 Hansen, D., 789, 839, 909.
 Hansen, E. N., 98, 100,

Hansen, H. C., 108, 857.
 Hansen, H. N., 541.
 Hansen, I. B., 512.
 Hansford, C. G., 814.
 Hanson, A. J., 549, 561.
 Hanson, F. E., 848.
 Hanson, H. C., 364.
 Hanson, K. B., 105.
 Hanson, V. T., 522.
 Harberg, G., 710.
 Hardenbergh, J. G., 709.
 Hardesty, M., 788.
 Harding, A., 524.
 Harding, C. F., 728.
 Harding, H. A., 708, 709.
 Harding, S. T., 720.
 Hardy, E. A., 731.
 Hardy, E. G., 450.
 Hardy, F., 516.
 Hardy, J. I., 565.
 Hargreaves, E., 234.
 Hargreaves, H., 548.
 Haring, C. M., 592.
 Harington, C. R., 172.
 Harlan, C. L., 644, 697.
 Harlan, H. V., 644.
 Harlan, J. D., 367.
 Harland, S. C., 344.
 Harman, R. W., 517.
 Harman, S. W., 236, 691.
 Harned, R. W., 645.
 Harper, H. J., 20.
 Harper, M., 890.
 Harper, M. W., 90.
 Harrington, C. F., 276.
 Harris, C. W., Jr., 445.
 Harris, H. C., 16, 37.
 Harris, H. M., 233, 828.
 Harris, L. E., 346.
 Harris, L. J., 105, 169, 904.
 Harris, M., 493.
 Harris, M. R., 823.
 Harris, R. H. T. P., 694.
 Harris, R. S., 620.
 Harris, R. V., 676.
 Harris, W. V., 234.
 Harrison, A. L., 61.
 Harrison, E. S., 99.
 Harrison, K., 489.
 Harrison, M. C., 776.
 Harrison, W., 324.
 Harrold, T. J., 599.
 Hart, E. B., 705, 839, 844, 848, 890.
 Hart, V. B., 443, 444.
 Harter, L. L., 812.
 Hartford, C. E., 120.
 Hartley, C., 679.
 Hartley, C. H., 480.
 Hartman, B. G., 494.
 Hartman, D. G., 475.
 Hartman, F. A., 475.
 Hartman, S. C., 49, 90.
 Hartman, W. A., 737.
 Hartner, F., 330.
 Hartsema, A. M., 27.
 Hartsuch, B., 709.

Hartzell, A., 235, 236, 683.
 Hartzell, F. Z., 236, 237.
 Harukawa, C., 694.
 Harvey, A. L., 405.
 Harvey, R. B., 25, 211, 212, 229, 341.
 Hase, A., 391, 833.
 Haseman, L., 78, 79.
 Hasenbusch, N. L., 521.
 Hashimoto, S., 421.
 Haskins, C. P., 638.
 Haskins, H. D., 25, 652.
 Hassan, A., 904.
 Hassan, S. R., 584.
 Hastings, E. G., 275, 848, 865.
 Hastings, R. J., 811, 823.
 Haterius, H. O., 642.
 Hathcock, J. S., 444.
 Hatz, E., 331.
 Haub, J. G., 394.
 Hauch, T. T., 471.
 Hauck, C. W., 127, 455.
 Haupt, H., 579, 580, 717, 719.
 Hausen, S. von, 781.
 Hausman, L. A., 682.
 Hauss, H., 624, 762.
 Hauter, L. H., 442.
 Hawk, P. B., 142.
 Hawkins, J. H., 385.
 Hawkins, L. E., 406.
 Hawkins, R. S., 42.
 Hawkins, S., 221.
 Haworth, W. N., 11.
 Hay, W. D., 46.
 Hayden, C. C., 99, 101.
 Hayden, C. E., 715.
 Hayes, A., 286.
 Hayes, H. K., 201, 318, 622.
 Hayes, M. W., 282.
 Hays, F. A., 96, 641, 846, 847.
 Hayward, E., 894.
 Hazley, V., 775.
 Headlee, T. J., 230, 242, 246, 685.
 Headley, F. B., 612.
 Heafford, R. M., 819.
 Heald, F. D., 663.
 Hearne, E. M., 783.
 Hebb, H. C., 218.
 Hebl, L. E., 730.
 Hecht, O., 234.
 Hedlund, G. W., 127.
 Hedström, H., 588.
 Heelsbergen, T. van, 434.
 Heffernan, H. N., 708.
 Heilbron, I. M., 150, 151, 320.
 Heiman, V., 90.
 Heimpel, L. G., 600.
 Heinbecker, P., 464.
 Heinicke, A. J., 213, 782.
 Heinsen, H., 280.
 Heinzman, M. A., 709.
 Heizer, E. E., 348.

Hellbaum, A., 642, 643.
 Heller, H. H., 716.
 Heller, R. E., 35.
 Hellinger, E., 676.
 Helm, R., 578, 580, 711.
 Helser, M. D., 89, 93, 126, 478.
 Hemmert-Halswick, A., 579.
 Hemmi, T., 229.
 Hendee, E. C., 553.
 Henderson, D. W., 711.
 Henderson, E. W., 89, 104, 719.
 Henderson, H. O., 848.
 Henderson, J., 381.
 Henderson, W. J., 60.
 Hendricks, W. A., 408.
 Hendrickson, A. A., 810.
 Hendrickson, A. H., 659.
 Henke, S., 580.
 Henke, L. A., 698.
 Hennes, L., 602.
 Henning, G. F., 127.
 Henning, W. L., 842.
 Henricksen, H. C., 38, 49.
 Henriksen, E., 266, 578.
 Henry, A. W., 530.
 Henry, B. S., 867.
 Henry, L. K., 637.
 Henry, M., 890.
 Henry, W. A., 161, 162.
 Hensill, G. S., 691.
 Henslow, T. G. W., 216.
 Henson, E. R., 27.
 Hepler, J. R., 364.
 Herbert, F. W., 357.
 Hercus, C. E., 315.
 Herdman, E. C., 193.
 Herford, G. V. B., 549.
 Hermano, A. J., 761.
 Herms, W. B., 243, 267, 394.
 Hernández, L. G., 474.
 Hernández V., A. E., 588.
 Herr, E. A., 72.
 Herrick, G. W., 237, 391, 685, 688.
 Herring, W. E., 728.
 Herron, W. F., 314.
 Herschler, H. M., 455.
 Hersherberger, M., 15.
 Hertwig, P., 640.
 Hertz, R., 642, 643.
 Hess, A. F., 153, 155, 259, 473.
 Hester, J. B., 503.
 Heurn, W. C. van, 553.
 Heuser, G. F., 90.
 Hewett, C. L., 352.
 Hewitt, L. F., 487.
 Hey, G. L., 397, 399.
 Heyroth, F. F., 169, 325.
 Heyward, F., 809.
 Hibbard, B. H., 443, 448.
 Hibben, S., 892.
 Hickman, C. W., 253, 406.
 Hickok, R. B., 3.
 Hicock, H. W., 80.

- Hienton, T. E., 125, 849, 853.
Higgins, F. L., 36, 47.
High, M. M., 824.
Hilberg, F. C., 846.
Hildebrand, E. M., 810.
Hilditch, T. P., 253, 759.
Hildreth, A. C., 216.
Hill, A., 797.
Hill, A. G., 516.
Hill, E., 315.
Hill, E. B., 130, 600.
Hill, F. F., 134, 443.
Hill, G. R., Jr., 644.
Hill, J. A., 405.
Hill, L. L., 77.
Hill, M., 34.
Hill, R. L., 892.
Hill, R. M., 152, 488.
Hill, W. H., 588.
Hill, W. L., 487.
Hillig, F., 494.
Hills, O. A., 825.
Hilton, G., 578.
Hilton, J. H., 849.
Hindmarsh, W. L., 580, 713.
Hinds, H. B., 702.
Hinds, W. E., 80, 81, 836.
Hingston, R. W. G., 824.
Hinman, E. H., 243.
Hinman, R. B., 35, 90, 348.
Hino, I., 527.
Hinsey, J. C., 787.
Hinshaw, W. R., 115, 595.
Hintikka, T. J., 224.
Hirayama, S., 229.
Hirsch, P., 7, 8.
Hirsch, W., 7.
Hirst, E. L., 11.
Hirst, M. C., 315.
Hisaw, F. L., 34, 198, 350, 642, 643.
Hiscock, I. V., 708, 709.
Hiura, M., 61.
Hixson, H., 697.
Hjärre, A., 591.
Ho, W. T. H., 531.
Hobart, C., 42.
Hobbs, S. H., Jr., 444.
Hobday, F., 435.
Hobson, A., 881.
Hobson, R. P., 559.
Hockensmith, R. D., 328.
Hockenyos, G. L., 826.
Hodges, J. A., 289.
Hodson, W. E. H., 243.
Hoeden, J. van der, 111, 591.
Hoepli, R., 589.
Hoffman, A. C., 881.
Hoffman, A. F., 478.
Hoffman, G. W., 289.
Hoffman, H. A., 863.
Hoffman, I. C., 49.
Hoffman, W. A., 73.
Hoffmann, C. H., 247.
Hoffmann, W. E., 77, 84, 559.
Höfler, K., 187.
Hofmann, P., 578.
Hofmann, W., 580.
Hogan, A. G., 152.
Hogben, L., 32, 33.
Hogg, J. G., 396.
Hoggan, I., 372.
Hoggan, I. A., 671, 810.
Holbert, J. C., 405.
Holbert, J. R., 40.
Hole, N., 436.
Holland, E. B., 643, 686.
Holley, K. T., 464.
Hollingshead, L., 785.
Holloran, C. P., 573.
Holloway, J. K., 71.
Hollowell, E. A., 40.
Holm, G. E., 260, 261.
Holmes, A. D., 149, 150.
Holmes, B. E., 108.
Holmes, C. E., 839, 865.
Holmes, C. L., 127, 444, 738.
Holmes, E., 215.
Holmes, F. S., 520.
Holmes, R. S., 19.
Holmquist, C. A., 708.
Holsen, T., 624.
Holton, C. S., 222, 346.
Honess, R. F., 267.
Honig, P., 517.
Hood, A. J. G., 708.
Hooper, C. H., 73, 76.
Hooton, D. R., 669.
Hopkins, A. W., 768.
Hopkins, E. F., 25, 213.
Hopkins, J. A., Jr., 127, 131, 610, 738.
Hopkins, J. W., 204.
Hopkins, S. J., 486.
Hopkirk, C. S. M., 427, 715.
Hopper, T. H., 73, 406, 468.
Hopper, W. C., 127.
Hoppert, C. A., 574.
Hori, H., 386.
Horlacher, W. R., 639.
Horn, C. L., 512, 520.
Hornberger, F. C., 387.
Horne, A. S., 539.
Hornung, 579.
Hornung, T. G., 881.
Horrall, B. E., 853, 854, 857.
Horsfall, F., Jr., 803.
Horsfall, J. G., 376.
Horst, E. C., von P. van der, 517.
Horst, K., 148.
Hörste, G. M. zu, 155.
Horvath, A. A., 910.
Hosking, F. J., 644.
Hosking, H. R., 814.
Hoskins, W. M., 394.
Hostetler, E. H., 406, 843, 859.
Houard, C., 382.
Houben, I., 383.
Hough, W. S., 239, 385, 386.
Houghland, G. V. C., 647.
Houser, J. S., 241.
Houthuis, M. J. J., 108.
Houtz, R. C., 771.
Höve, K. R., 578, 710.
Hovlid, M., 747.
Howard, B. J., 824.
Howard, C. H., 620.
Howard, L. O., 383.
Howard, N. F., 84, 547, 683, 824.
Howe, G. H., 367.
Howe, H., 443.
Howell, C. E., 111.
Howell, L. D., 605, 645.
Howitt, B., 592.
Howk, B. W., 40.
Hoyt, H. R., 38.
Hsiung, T. S., 275.
Hubbard, J. W., 204, 357.
Huber, G. A., 674.
Huber, H. F., 911.
Huber, L. L., 72, 832.
Huberty, M. R., 451, 452.
Hucker, G. J., 428, 715, 855.
Huddleson, I. F., 718.
Hudelson, R. R., 443.
Hudson, C. B., 114, 279, 280, 435, 436, 864.
Hudson, L., 616.
Hudson, R. S., 405, 568.
Hughes, A. W. McK., 391.
Hughes, H. D., 37, 127.
Hughes, J. S., 248, 249, 257, 570.
Hughes, R. M., 478.
Hughes, T. P., 194.
Hull, F. H., 199.
Hull, J. B., 243, 267.
Hull, W. W., 514.
Hülphers, G., 544.
Hultz, F. S., 406.
Hume, A. N., 532.
Hummel, B. L., 299, 480.
Humphrey, E. N., 123.
Humphrey, G. C., 848, 865.
Humphrey, H. B., 650.
Humphrey, L. M., 639, 785.
Humphrey, R. R., 14.
Humphreys, F., 270.
Humphreys, W. J., 176, 634, 776.
Humphries, A., 201.
Humphries, S., 201.
Hungerford, C. W., 677.
Hunscher, H. A., 751.
Hunt, C. H., 90, 99, 152, 406, 839.
Hunter, B., 293.
Hupka, E., 578.

Hurd, E. B., 127.
 Hurd-Karrer, A. M., 26, 650.
 Hurlbut, L. W., 875.
 Hurley, R., 129, 911.
 Hurst, C. C., 32, 190.
 Hurst, L. A., 45, 516.
 Hurst, W. M., 727.
 Husain, M. A., 689.
 Huskins, C. L., 783.
 Husselman, R., 728.
 Hutchins, A. E., 211.
 Hutchins, W. A., 444.
 Hutchinson, J. B., 43, 783.
 Hutchison, C. B., 157.
 Hutson, R., 73, 83, 247, 547, 548, 550.
 Hutt, F. B., 31, 318.
 Huttar, J. C., 116.
 Huxley, J. S., 344.
 Huxley, L. G. H., 495.
 Hyde, A. M., 766.
 Hypes, J. L., 139, 301, 888.
 Hyslop, J. A., 685.

Iachevskii, A. A., 374.
 Ibsen, H. L., 193.
 Iddings, E. J., 909.
 Ibrig, K., 601, 610.
 Illick, J. S., 601.
 Illingworth, J. L., 225.
 Imms, A. D., 395.
 Inamdar, R. S., 189.
 Ingham, L. W., 572.
 Innes, J. R. M., 105.
 Inoue, T., 105, 421.
 Insko, W. M., Jr., 571, 704.
 Ionescu-Sisesti, G., 602.
 Irvin, C. J., 794.
 Irwin, M., 188.
 Irwin, M. R., 194.
 Irwin, R. E., 709.
 Isaac, P. V., 695.
 Isaac, W. E., 338.
 Isaachsen, H., 563.
 Isham, P. D., 309, 903.
 Ishigame, T., 738.
 Ispolatow, W., 578.
 Israelsen, O. W., 118.
 Ito, K., 385.
 Ito, S., 421.
 Itô, T., 824.
 Ivanoff, S. S., 810.
 Ives, L. D., 278.
 Iwanoff, X., 710.
 Iwata, K., 560.
 Iyengar, R. L. N., 906.

Jackisch, J., 8.
 Jackson, A. D., 621.
 Jackson, C., 420.
 Jackson, D. D., 323.
 Jackson, F. K., 788.
 Jackson, H. C., 848.
 Jackson, H. M., 895.
 Jackson, L. W. R., 679.

Jackson, R. W., 145, 617.
 Jacob, K. D., 487, 780.
 Jacobs, E. E., 573.
 Jacobson, H. G. M., 649.
 Jacques, W. A., 39.
 Jaenicke, M., 117.
 Jaffé, R., 596.
 Jahn, O., 118.
 James, E. M., 323.
 James, H. C., 555, 556.
 James, L. H., 256, 462, 704.
 James, N., 184.
 Jamieson, G. S., 4.
 Janes, E. R., 466.
 Janes, M. J., 837.
 Janisch, E., 383.
 Janse, A. J. T., 557.
 Jansen, B. C. P., 151.
 Janssen, G., 781.
 Jardine, J. T., 766.
 Jármai, K., 579, 710.
 Jarvis, H., 831.
 Jary, S. G., 72.
 Jaynes, H. A., 692.
 Jefferies, J. H., 209.
 Jefferson, C. H., 621.
 Jefferson, L. P., 737.
 Jeffrey, R. N., 26.
 Jellison, W. L., 382, 431.
 Jenkins, A. E., 821.
 Jenkins, E. W., 805.
 Jenkins, H., 177, 332.
 Jenkins, M. T., 37.
 Jennings, W. C., 206.
 Jenny, H., 779.
 Jensen, P. B., 187.
 Jensen, W. C., 291, 358.
 Jepson, F. P., 687.
 Jesness, O. B., 603.
 Jesus, P. I. de, 392.
 Jesus, Z. de, 590.
 Jewell, W., 325.
 Joel, A. H., 320.
 Joffe, J. S., 179, 635.
 Johann, H., 667.
 Johansson, I., 348, 640.
 John, J. L., 644.
 Johns, C. K., 706, 708.
 Johnson, A. G., 62.
 Johnson, C. A., 327.
 Johnson, D. E., 222.
 Johnson, E. C., 135, 443.
 Johnson, E. M., 615.
 Johnson, E. P., 115.
 Johnson, E. W., 210.
 Johnson, G. E., 232.
 Johnson, H. K., 601.
 Johnson, H. W., 718.
 Johnson, J., 372.
 Johnson, J. P., 546.
 Johnson, M. S., 544.
 Johnson, O. M., 442.
 Johnson, O. R., 601.
 Johnson, P. R., 43.
 Johnson, R. F., 253, 412.

Johnson, S., 289.
 Johnson, S. E., 131, 603, 623.
 Johnson, T., 63, 64.
 Johnson, W. T., 267.
 Johnstin, R., 324.
 Johnston, C. O., 64, 667.
 Johnston, J. W., 245.
 Johnston, S., 55.
 Johnstone, R. N., 595.
 Joley, L., 675.
 Jones, A., 444.
 Jones, D. B., 4.
 Jones, D. F., 157.
 Jones, D. H., 69.
 Jones, E. E., 112.
 Jones, E. R., 880.
 Jones, E. T., 644.
 Jones, E. W., 230, 835.
 Jones, F. M., 238, 383, 586.
 Jones, F. R., 668.
 Jones, F. S., 714.
 Jones, G. H. G., 335, 341.
 Jones, H. A., 51, 234, 670.
 Jones, I., 175.
 Jones, I. D., 318, 657, 799.
 Jones, J. H., 91.
 Jones, J. M., 91.
 Jones, J. W., 44.
 Jones, L. H., 635, 652, 663.
 Jones, L. I., 644.
 Jones, L. R., 372.
 Jones, M. F., 267, 268.
 Jones, M. G., 320, 792.
 Jones, M. M., 439.
 Jones, N. K., 912.
 Jones, P. A., 90.
 Jones, R. M., 825.
 Jones, S. A., 697.
 Jones, T. E., 644.
 Jones, T. H., 233.
 Jones, T. N., 732.
 Jones, W. H., 727.
 Jones, W. W., 73, 242.
 Jordaan, J. J., 450.
 Jordan, E. O., 426.
 Jordan, H. E., 330.
 Jordan, S., 323.
 Jordan, W. H., 477.
 Jorden, T. J. W., 421.
 Joseph, A. F., 43.
 Joslyn, M. A., 615, 772.
 Jost, L., 187.
 Joy, N. H., 395.
 Joyet-Lavergne, P., 349.
 Jugenheimer, R. W., 37.
 Jukes, T. H., 632, 703.
 Julius, G. A., 686.
 Jull, M. A., 411, 641, 697.
 Junghans, J. R., 517.
 Jungherr, E., 594, 869.
 Jungherr, E. L., 113, 115.
 Justice, R. S., 422.
 Jutila, K. T., 602.

- Kable, G. W., 598.
 Kaempffer, A., 640.
 Kagy, E. S., 869.
 Kahlenberg, O. J., 698.
 Kalamkar, R. J., 647, 650.
 Kalandra, A., 679.
 Kalenscher, H., 579.
 Kamei, S., 70.
 Kameníček, L. F., 198.
 Kammlade, W. G., 141.
 Kaneko, T., 469.
 Kangas, E., 638.
 Kardos, L. T., 160.
 Karpechenko, G. D., 508.
 Karper, R. E., 28, 784.
 Karraker, P. E., 45.
 Karrer, A. M. H., 26, 650.
 Karrer, P., 150.
 Karsten, H., 14.
 Karström, H., 781.
 Kato, T., 421.
 Kaupp, B. F., 593.
 Kawada, A., 692.
 Kay, H. D., 473, 632.
 Keane, J. C., 517.
 Kearns, H. G. H., 552, 558.
 Keck, W. N., 788.
 Keeble, F., 188.
 Keeler, C. E., 195, 510.
 Keen, F. P., 73.
 Keenan, J. A., 839, 844, 848.
 Keifer, H. H., 73, 232.
 Keilin, D., 838.
 Keim, F. D., 28.
 Keith, T. B., 698, 842.
 Keitt, G. W., 810.
 Kelbert, D. G. A., 221.
 Keller, A., 340.
 Kelley, J. L., 663, 687.
 Kelley, M. A. R., 441, 600.
 Kelley, V. W., 800.
 Kelley, W. P., 185.
 Kellogg, C. E., 448.
 Kelly, E., 709, 890.
 Kelly, E. G., 825.
 Kelly, M. F., 848.
 Kelly, W., 271.
 Kelser, R. A., 434, 709.
 Kelsheimer, E. G., 72.
 Kemmerer, A. R., 839.
 Kempf, C., 774.
 Kendall, E. W., 548.
 Kendall, J. C., 477.
 Kendeigh, S. C., 381.
 Kendrick, P., 276, 869.
 Kennard, D. C., 90, 97, 104, 570.
 Kennedy, C., 258.
 Kennedy, E. M., 888.
 Kenworthy, O. C., 117.
 Kenyon, F., 751.
 Kerekes, F., 875.
 Kerling, L. C. P., 673.
 Kern, F. D., 811, 912.
 Kernkamp, H. C. H., 93, 432.
 Kerr, H. W., 516.
 Kertesz, Z. I., 343, 376, 491.
 Key, K. M., 631.
 Khan, A. R., 795.
 Khan, A. W., 689.
 Kick, C. H., 90, 147, 194, 843.
 Kidd, F., 803.
 Kidd, M. N., 228.
 Kidder, R. W., 199, 248.
 Kiely, J. R., 871.
 Kifer, H. B., 308.
 Kifer, R. S., 131.
 Kightlinger, C. V., 663.
 Kik, M. C., 618, 758, 760.
 Kildee H. H., 93, 478.
 Killough, D. T., 514, 639.
 Kiltz, B. F., 205.
 Kimball, D. A., 523.
 Kimball, H. H., 332, 776.
 Kime, P. H., 43, 94, 203.
 Kincaid, R. R., 199.
 Kindt, L. E., 609.
 King, A. G., 352.
 King, A. T., 315.
 King, C. G., 10, 168, 774.
 King, C. M., 37.
 King, E. J., 170.
 King, E. L., 352.
 King, F. G., 841.
 King, G. E., 799.
 King, H. H., 248.
 King, H. M., 588.
 King, K. M., 548, 695.
 King, N. J., 516.
 Kinghorn, I. G., 768.
 Kingscote, A. A., 548.
 Kinnersley, H. W., 326.
 Kinnison, A. F., 379.
 Kinoshita, S., 692.
 Kirby, G. M., 543.
 Kirk, L. E., 793.
 Kirkpatrick, E. L., 301, 600, 613, 745, 889.
 Kirschner, R., 234.
 Kislovsky, D. A., 407.
 Kisslowsky, D., 640.
 Kitchin, A. W. M., 566, 567.
 Kitselman, C. H., 265.
 Kitsuta, K., 186.
 Klebahn, H., 372.
 Klein, G., 188.
 Klein, H. Z., 233.
 Klein, L. A., 855.
 Kleinpaul, K. N., 710, 711.
 Klemmedson, G. S., 135.
 Klemola, V., 640.
 Kletzien, S. W., 616.
 Klimmer, M., 271.
 Kline, E. K., 117.
 Kline, O. L., 839, 844, 848.
 Klobucher, F. J., 809.
 Klotz, L. J., 540.
 Klusmann, E., 466, 467.
 Knapp, B., Jr., 405.
 Knapp, J. G., 443, 455.
 Knapp, J. O., 480.
 Knaysi, G., 425.
 Kneeland, H., 739.
 Knight, H. G., 601, 652.
 Knight, P., 545.
 Knoop, C. E., 99.
 Knott, J. E., 51.
 Knowles, A. S., Jr., 24, 90.
 Knowles, F., 637.
 Knowlton, G. F., 553, 685, 837.
 Knowlton, H. E., 212, 215.
 Knudson, A., 313, 314.
 Knudson, L., 25.
 Koch, K., 825.
 Koch, L. W., 537.
 Koch, P., 450.
 Koch, R., 551.
 Kochkina, E. M., 678.
 Kock, G. de, 421.
 Kodama, M., 582.
 Koehler, A., 219, 661.
 Kofoid, C. A., 425.
 Köhler, E., 816.
 Köhler, G., 877.
 Kohman, E. F., 619.
 Kojima, T., 233.
 Kojoukharoff, Y., 610.
 Kokoski, F. J., 491.
 Kolb, J. H., 299.
 Kolodziejska, S., 901.
 Koltzoff, N. K., 642.
 Koningsberger, V. J., 516.
 Konno, T., 421.
 Kōno, M., 582.
 Koolhaas, D. R., 383.
 Kopeć, S., 193, 194.
 Kopland, D. V., 789, 839, 848, 909.
 Korczewski, M., 188.
 Korenchevsky, V., 351, 352, 759.
 Koroleff, A. M., 120.
 Korsmo, E., 797.
 Kostoff, D., 30.
 Kotchkin, E. M., 678.
 Kovachevski (Kovachevsky, J.). I. Khr., 223, 534.
 Koval'skaia, L. M., 743.
 Kozelka, A. W., 641.
 Kraft, K., 170, 774.
 Kraneveld, F. C., 579.
 Krantz, F. A., 795.
 Kratz, P. D., 462.
 Krause, C., 580, 711.
 Krauss, W. E., 99, 101, 102, 574, 709.
 Kraybill, H. R., 781, 841.
 Kress, C. B., 460.
 Krewatch, A. V., 598.
 Krieger, C. G., 731.
 Krijgsman, B. J., 400.
 Krinizin, D. J., 579.
 Krishnamurti, B., 395.
 Kriss, M., 406, 414, 698.
 Kříženecký, J., 198.
 Krueger, A. P., 592.

- Krueger, M. E., 59.
 Krueger, P. F., 709.
 Krumbholz, G., 522.
 Krusekopf, H. H., 118, 601.
 Krynine, D. P., 118.
 Krzemieniewski, S., 372.
 Kugelmass, I. N., 143.
 Kuhlman, A. F., 348.
 Kuhn, O., 349.
 Kuhn, R., 150.
 Kühnau, J., 465.
 Kumashiro, S., 694.
 Kumm, H. W., 393.
 Kung, L., 145.
 Kunkel, L. O., 386.
 Kuntz, P. R., 67.
 Kuntz, R. R., 517.
 Kuntz, W. A., 221.
 Kurata, S., 229.
 Kurtz, E. B., 877.
 Kusano, S., 62.
 Kutter, H., 549.
 Kuttner, A. G., 582.
 Kuwana, S. L., 225.
 Kuwayama, S., 560.
 Kyrk, H., 765.
 Kyzer, E. D., 254.
- Laar, J. H. J. van de, 374.
 Lachat, L. L., 762.
 Lachmund, H. G., 679.
 Lacroix, D. S., 518, 550.
 Lacy, H. E., 599.
 Lacy, M. D., 406.
 Ladd, C. E., 443.
 Lagassé, F. S., 48.
 Laidlaw, W. B. R., 560, 837.
 Laird, D. G., 588.
 Lamarre, L., 585.
 Lamb, C. A., 796.
 Lamb, G., 908.
 Lambert, A. R., 43.
 Lambert, W. V., 89, 104, 347.
 Lancefield, R. C., 581.
 Landauer, W., 195, 196, 642.
 Landis, B. J., 245.
 Landis, B. Y., 202.
 Landis, P. H., 301.
 Landis, Q., 324.
 Lang, K., 173.
 Langdon, H. H., 317, 876.
 Langenbuch, R., 233.
 Langeron, 753.
 Langevin, E., 262.
 Langford, G. S., 78.
 Langlands, I., 661.
 Langley, D. D., 898.
 Langord, L., 798.
 Lantow, J. L., 405.
 Lantz, E. G., 768.
 Lantz, E. M., 155.
 Lantz, H. L., 48, 800.
 Larchin, B. A., 407.
 Larmer, F. G., 67.
 Larrimer, W. H., 644, 650.
 LaRue, C. D., 782.
- Lascelles, H. R., 767.
 Lathrop, A. W., 405.
 Lathrop, F. H., 85.
 Lathrop, F. W., 459.
 Latif, A., 578.
 Latimer, L. P., 364.
 Latimer, W. J., 15, 179.
 Latshaw, W. L., 257, 622.
 Latyszewski, M., 193.
 Latzke, E., 369, 406, 468.
 Laurens, H., 313, 410, 474, 897.
 Laurie, A., 48, 807.
 Lauritzen, J. I., 812.
 Lautz, A., 890.
 Lavergne, P. J., 349.
 Lawless, J. J., 351.
 Lawyer, E. A., 910.
 Layton, D. V., 60.
 Leach, J. G., 318, 669.
 Leach, R., 526, 555.
 Lease, J., 890.
 Leavitt, H. W., 327.
 Lebedev, A. G., 233.
 LeClerc, J. A., 512.
 Lecoq, R., 760.
 Ledingham, J. C. G., 372.
 Lee, A., 534.
 Lee, A. R., 697.
 Lee, C. H., 332.
 Lee, L. L., 451.
 Leeming, J. F., 216.
 Leeper, R. B., 868.
 Leeson, H. S., 392.
 Leete, B. E., 57, 810.
 LeFevre, P. E., 708.
 Legg, J., 866.
 Lehman, R. S., 84.
 Lehman, S. G., 43.
 Lehnert, E., 592.
 Leitch, J. N., 750.
 Leith, B. D., 791, 810.
 Lek, H. A. A. van der, 188.
 Le Mert, H. W., 799.
 Lemmermann, O., 14.
 Lennox, C. G., 206.
 Lentz, G. H., 661.
 Leonard, L. T., 519.
 Leonard, M. D., 70, 72, 73, 548.
 Leonard, S. L., 34, 350.
 Leopold, A., 543, 624.
 Le Pelley, R. H., 551.
 Lepik, E., 812.
 Lepkovsky, S., 464, 468.
 Lerner, I. M., 435.
 Lerner, M., 348.
 Lesbouyries, 587.
 Lescure, J. M., 709.
 Lesley, J. W., 55.
 Leśniewski, V., 602.
 Lesser, C. E., 415.
 Lestoquard, F., 587.
 Leukel, R. W., 62.
 Leukel, W. A., 199.
 Levene, P. A., 166.
 Levine, M. N., 63.
- Lewis, A. B., 127.
 Lewis, A. H., 215, 340.
 Lewis, D. E., 385.
 Lewis, H. B., 4.
 Lewis, I. P., 48.
 Lewis, R. C., 152, 753, 754, 763.
 Lewis, W. R., 350.
 Lichtenberger, B., 123.
 Liebster, B., 269.
 Lienhardt, H. F., 248, 249, 257, 265.
 Liesegang, R. E., 323.
 Light, R. F., 259.
 Light, S. F., 237.
 Ligneris, M. J. A. des, 115.
 Lignièrès, J., 860.
 Lill, J. G., 879.
 Lilleland, O., 655.
 Lilly, C. A., 471, 475.
 Lilly, J. H., 233, 825, 830.
 Liming, O. N., 383.
 Linde, N. T. v. d., 421.
 Lindgren, R. M., 679, 680.
 Lindsey, A. H., 737.
 Lindsey, G. A., 165.
 Lindsey, J. B., 99, 319, 705.
 Lindstedt, H., 610.
 Lindstrom, D. E., 887.
 Lindstrom, E. W., 37, 60, 508, 785.
 Lineberry, R. A., 56.
 Linehan, P. A., 345.
 Lineweaver, H., 486.
 Ling, A. W., 797.
 Lininger, F. F., 479.
 Link, K. P., 533.
 Linneboe, J. C., 848.
 Linton, R. G., 409.
 Lipman, J. G., 14, 451, 601.
 Liro, J. I., 220.
 Lisbonne, M., 582.
 Lisitskii, E. F., 348.
 Lissitzky, E. F., 348.
 List, G. M., 241.
 Little, C. C., 348.
 Little, R. B., 586.
 Liu, S. H., 171, 172.
 Lively, C. E., 139, 299.
 Livingstone, E., 690.
 Lloyd, D. J., 315.
 Lloyd, F. E., 188.
 Lloyd, J. W., 51, 52.
 Lloyd, O. G., 888.
 Lloyd, R. W., 174.
 Lobdell, R. N., 232.
 Lobik, V. I., (W. J.), 668.
 Lockwood, J. E., 475.
 Lockwood, S., 387.
 Lodewick, J. E., 370.
 Loeb, L., 197, 350.
 Loeffel, W. J., 91.
 Loew, E. R., 467.
 Loftin, U. C., 550.
 Lohr, E. W., 117.
 Lohse, H. W., 498.
 Lond, L. M. S. S. A., 115.

- Longley, A. E., 190.
 Longwell, B. B., 152.
 Longwell, J. H., 406.
 Lonsdale, T., 315.
 Loofbourow, J. R., 169, 325.
 Loomis, W. E., 505.
 López Domínguez, F. A., 515
 516, 517, 909.
 Loschakowa-Hasenbusch, N.,
 521.
 Lott, R. V., 656, 799.
 Loucks, K. W., 221, 660.
 Loughlin, R., 462.
 Loughry, F. G., 17.
 Lounsbury, C., 333, 777.
 Lovejoy, D. E., 353, 364.
 Loveland, R., 633, 683.
 Lovell, O. H., 85.
 Lovell, R., 105.
 Lucas, P. S., 707, 709.
 Lucie-Smith, M. N., 775.
 Lucker, J. T., 267, 268.
 Ludbrook, W. V., 810.
 Ludkiewicz, Z., 610.
 Ludwig, D., 695.
 Luncz, G., 602.
 Lundborg, M., 466.
 Lundegårdh, H. G., 188
 372.
 Lunden, A. P., 190.
 Lundgren, H., 892.
 Lush, J. L., 31, 89, 98,
 252, 405, 507, 509.
 Lush, R. H., 405.
 Lute, A. M., 363.
 Lüttschwager, 711.
 Luy, P., 578.
 Luyten, I., 27.
 Lyman, O. H., 206.
 Lynsky, M., 741.
 Lyon, T. L., 499.
 Lyons, J., 851, 852.
 Lyons, T. A., 767.

 McAlister, L. C., Jr., 83.
 MacAloney, H. J., 245.
 McAtee, W. L., 72, 382.
 McBain, J. W., 323.
 McBride, C. G., 127, 742.
 McBurney, J. W., 283.
 McCall, R., 405.
 McCall, T. M., 817.
 MacCallum, W. G., 865.
 McCampbell, C. W., 248,
 405.
 McCann, L. P., 405.
 McCarrison, R., 761.
 McCarter, J., 275, 865.
 McCarthy, E. F., 808.
 McCarthy, J. L., 176, 177.
 McCarty, M. A., 405.
 McCay, C. M., 90, 99, 405,
 752.
 McClean, A. P. D., 533,
 535.
 McClelland, T. B., 38, 49,
 158.

 McClement, J., 415.
 McClintock, J. T., 465.
 McClure, F. J., 698, 754.
 McClure, G. M., 513.
 McClure, J. T., 38, 874.
 McCollum, E. V., 895.
 McConnie, R. C., 516.
 McCool, M. M., 22, 323.
 McCordock, H. A., 424.
 McCormick, F. J., 442.
 McCormick, T. C., 745.
 MacCorquodale, D. W., 484.
 McCoy, E., 776.
 McCrady, M. H., 262.
 McCray, F. A., 345.
 McCreary, D., 71, 81.
 McCue, C. A., 48, 157, 365,
 746.
 McCuen, G. W., 116, 438.
 McCulloch, E. C., 106, 107,
 272, 423, 709, 848, 865.
 McCutcheon, C. T., 708.
 McDaniel, E. I., 76, 553,
 827.
 MacDaniels, L. H., 654,
 800, 802.
 McDonald, F. G., 703.
 MacDonald, G. B., 58.
 McDonel, K. H., 457.
 McDonnell, R. E., 728.
 MacDougall, R. S., 686.
 McDowell, J. C., 705.
 McDowell, M. F., 160.
 McElroy, W. S., 314.
 McEwen, A. D., 716.
 McFadyean, J., 428.
 McFarland, J. H., 369.
 McFarlane, W. D., 703.
 McGeorge, W. T., 499, 516.
 McGonigle, G. C. M., 305.
 McGovran, E. R., 824.
 McGrath, C. B., 277.
 McGrath, T. T., 580.
 Macgregor, D. H., 444.
 McGregor, E. A., 387.
 McGuire, L. P., 538, 676.
 Machacek, J. E., 376.
 McHardy, D. N., 123.
 McHargue, J. S., 366, 497.
 McIndoo, N. E., 557.
 MacIntire, W. H., 18, 503.
 McIntosh, A., 267.
 McIntyre, A. C., 218, 370,
 808.
 Mack, M. J., 705.
 McKay, H., 143, 616.
 McKay, M. B., 823.
 McKay, R., 815.
 McKee, C., 46.
 McKenney, F. D., 114.
 McKenzie, M. A., 679.
 McKibben, E. G., 597.
 McKibben, H. B., 142.
 McKibbin, R. R., 496.
 McKinlay, P. L., 305.
 McKinney, R. S., 4.
 Mackintosh, D. L., 406.

 McLarty, H. R., 536.
 McLaughlin, F. A., 363.
 McLaughlin, J. B., 38.
 McLaughlin, W. W., 118,
 443.
 McLean, D. M., 793.
 McLean, H. C., 210, 684.
 MacLeod, F. L., 756.
 MacLeod, G., 749.
 MacLeod, G. F., 61, 71.
 MacLeod, J., 110, 590, 694.
 McMahan, E., 73.
 McMaster, N. B., 495.
 McMunn, R. L., 657, 802.
 McMurray, M. R., 570.
 McMurtrey, J. E., Jr., 362.
 McNall, F. J., 487.
 McNall, P. E., 613, 881, 889.
 McNally, E., 846.
 McNamara, H. C., 669, 814.
 McNess, G. T., 43.
 McNew, G. L., 60, 820, 821.
 McNutt, S. H., 713.
 Maconachie, J. E., 287.
 Macoun, W. T., 768.
 McPhail, M., 82.
 McRae, W., 535.
 Macrosty, H. W., 458.
 Macself, A. J., 524.
 McWhorter, C. C., 737.
 Macy, H., 318, 850.
 Macy, I. G., 751.
 Maddeford, C. W., 262.
 Madhava, K. B., 761.
 Madsen, L. L., 36.
 Magness, J. R., 54, 652.
 Mahalanobis, P. C., 792.
 Mahan, W., 49.
 Maheux, G., 548.
 Maire, R., 372.
 Malhotra, R. C., 188.
 Malik, L. A., 90.
 Malkani, P. G., 587.
 Malkani, T. J., 796.
 Malkmus, B., 577.
 Mallery, T. D., 180.
 Mallmann, W. L., 270, 861.
 Maltais, J. B., 547, 557.
 Manchester, A. W., 443.
 Maney, T. J., 48.
 Mangelsdorf, A. J., 206.
 Mangelsdorf, P. C., 345.
 Manhart, V. C., 138, 853.
 Manley, F. H., 109.
 Mann, A. R., 451.
 Mann, F. C., 863.
 Mann, H. B., 43, 56, 128,
 205.
 Manninger, R., 579.
 Manns, T. F., 16, 60.
 Manny, T. B., 132.
 Manresa, M., 407.
 Manson, P. W., 725.
 Manwell, R. D., 267.
 Marais, I. P., 420.
 Maralihalli, S. S., 784.
 Marcovitch, S., 76.

- Marcus, B. A., 233.
 Mardles, E. W. J., 323.
 Maré, G. S., 421.
 Mark, H., 315.
 Markee, J. E., 787.
 Markin, F. L., 373.
 Markley, K. S., 368, 655.
 Marley, S. P., 121.
 Marmoy, F. B., 340.
 Marquardt, J. C., 417, 707.
 Marrian, G. F., 511.
 Marritt, J. W., 670.
 Marsh, G. L., 615, 772.
 Marsh, H., 270, 430.
 Marsh, M. C., 315.
 Marshall, G. E., 831.
 Marshall, H. L., 487.
 Marshall, J., 548.
 Marshall, P. G., 33, 351.
 Marshall, R. E., 3.
 Marston, A. R., 513.
 Martin, C. L., 420, 511, 861.
 Martin, E., 406.
 Martin, H., 73, 228, 664, 817, 821.
 Martin, J. F., 208.
 Martin, John H., 293, 644.
 Martin, Jos. H., 571, 704.
 Martin, J. P., 206, 534, 535.
 Martin, R. J., 176.
 Martin, R. K., 267.
 Martin, S. J., 34.
 Martin, T. L., 496.
 Martin, W. H., 257, 419.
 Martin, W. W., 601.
 Martinez de Bujanda, E., 602.
 Marvin, G. E., 87.
 Maskell, E. J., 188.
 Mason, A. C., 385.
 Mason, H. C., 84.
 Mason, I. C., 364, 385.
 Mason, J. H., 589.
 Mason, L., 474.
 Mason, T. G., 188.
 Massengale, O. N., 620, 703.
 Massey, L. M., 61, 369.
 Massey, Z. A., 406.
 Masters, H., 747.
 Maternowka (Maternowska), I., 580.
 Matheson, R., 392.
 Mathews, F. P., 867.
 Mathias, P., 683.
 Mathur, R. N., 828.
 Matlock, R. L., 42.
 Matthewman, W. G., 548.
 Matthews, R. B., 728, 878.
 Mattson, S., 327.
 Matz, J., 672.
 Maughan, F. B., 76.
 Maurer, E. R., 283.
 Maxcy, K. F., 870.
 Maximov, N. A., 341.
 Maxton, J. L., 912.
 May, C., 61.
 May, J. B., 543.
- Mayer, I. D., 439.
 Mayerson, H. S., 313, 410, 474.
 Mayfield, H. L., 617, 899.
 Mayhew, R. L., 267, 594.
 Maynard, L. A., 90, 99, 405, 406.
 Mead, D. W., 874.
 Mead, E., 769.
 Mead, E. S., 450.
 Meade, J. E., 737.
 Means, R. H., 622.
 Megee, C. R., 158.
 Meginnis, H. G., 59.
 Mehring, A. L., 359.
 Mehta, K. C., 372.
 Meiklejohn, A. P., 902.
 Mélanidi, C., 590.
 Meleney, F. L., 270.
 Meleney, H. E., 266.
 Melhus, I. E., 60, 820.
 Mellon, A. W., 289.
 Meloche, V. W., 489.
 Mémery, H., 175.
 Menck, F., 578.
 Mendel, L. B., 144, 148.
 Mendenhall, D. R., 890.
 Menéndez Ramos, R., 517.
 Mercer, S. P., 345.
 Merchant, C. H., 444, 445.
 Merchant, I. A., 269.
 Merrill, L. S., 767.
 Merritt, J. M., 561, 685, 837.
 Mert, H. W. Le, 799.
 Merwe, C. P. van der, 556.
 Metcalf, C. L., 232.
 Metcalfe, M. E., 393, 558.
 Metzger, F. W., 73, 83, 245.
 Metzger, H., 289.
 Metzger, H. J., 35, 276.
 Metzger, N., 633, 773.
 Meyer, A., 579.
 Meyer, A. E., 463.
 Meyer, K. F., 592.
 Meyer, R. K., 34, 352.
 Meyers, M. T., 556.
 Meyn, A., 716.
 Mglej, S., 580, 710.
 Michael, L. J., 189.
 Michael, V. M., 115.
 Michaelian, M. B., 103.
 Micheel, F., 170, 774.
 Michelbacher, A. E., 87, 394.
 Mickle, F. L., 584.
 Middleton, G. K., 359, 360.
 Middleton, W., 385, 561.
 Miessner, H., 716.
 Mighell, R. L., 737.
 Milam, J., 78.
 Miles, H. W., 561.
 Miles, M., 389, 556.
 Milford, H., 319.
 Milks, C. H., 713.
 Millard, W. A., 533.
 Millen, F. E., 768.
 Miller, C. D., 143, 747, 756.
- Miller, C. O., 616, 619.
 Miller, D., 244.
 Miller, D. F., 394.
 Miller, D. G., 725.
 Miller, D. K., 470.
 Miller, E., 737.
 Miller, E. B., 323.
 Miller, E. J., 488.
 Miller, E. R., 121, 176, 332.
 Miller, F. W., 715.
 Miller, H. M., Jr., 426.
 Miller, J. C., 564.
 Miller, J. M., 397.
 Miller, L. P., 341, 506.
 Miller, M. F., 118, 601, 622.
 Miller, M. W., 844.
 Miller, N. C. E., 76.
 Miller, N. J., 264.
 Miller, P. L., 126, 127.
 Miller, P. R., 663.
 Miller, R. C., 116, 698.
 Miller, R. F., 565.
 Miller, R. L., 73.
 Miller, W. T., 274.
 Mills, E. M., 682.
 Mills, O. L., 289.
 Mills, W. D., 61.
 Milton, W. E. J., 644.
 Minett, F. C., 109.
 Minor, W. A., Jr., 599.
 Minster, C. H., 851.
 Mirskaia, L., 35, 196.
 Misawa, H., 6.
 Misner, E. G., 454.
 Misra, C. S., 388.
 Misra, R. N., 795.
 Mistikawi, A. M., 688.
 Mitchell, A. J., 332.
 Mitchell, C. L., 176.
 Mitchell, D. R., 881.
 Mitchell, D. T., 709.
 Mitchell, H. H., 700.
 Mitchell, J. B., Jr., 198.
 Mitchell, J. McK., 154.
 Mitchell, J. W., 638.
 Mitchell, L. C., 487.
 Mitchell, W. C., 394, 858.
 Mitchener, A. V., 548.
 Mitra, S. K., 30, 795.
 Miyamoto, S., 483.
 Moak, H., 709.
 Mócsy, J. v., 580.
 Moffett, H. C., 699.
 Mohendra, K. R., 373.
 Mohler, J. R., 697.
 Mohr, E. C. J., 516.
 Mohr, J. C. van der M., 550.
 Moir, W. W. G., 206, 515, 516, 517.
 Molina, R. R., 267.
 Moll, T., 9.
 Möller, C., 125.
 Mollin, F. E., 275.
 Molloff, J. S., 602.
 Molyneux, H., 569.
 Monclova, H. E. C., 517.
 Monier, H. B., 848.

- Mönnig, H. O., 420.
 Monroe, C. F., 99.
 Monroe, M. M., 477.
 Monsch, H., 890.
 Montgomerie, R. F., 588.
 Moody, A. F., 256.
 Moody, V. A., 602.
 Mook, D. E., 852.
 Moon, H. H., 366.
 Moore, C. N., 638.
 Moore, H. C., 445, 648.
 Moore, H. R., 127, 128.
 Moore, J. G., 798.
 Moore, J. M., 125.
 Moore, P. H., 174.
 Moore, T., 150, 902.
 Moore, W., 477, 683.
 Moore, W. J., 643.
 Morey, N. L. B., 890.
 Morgan, A. F., 757, 891.
 Morgan, B. G. E., 631.
 Morgan, D. O., 436.
 Morgan, E. L., 601.
 Morgan, H., 90.
 Morgan, J. C., 170.
 Morgan, M. F., 519.
 Morgan, N. D., 120.
 Morgan, O. S., 602.
 Morgan, T. H., 344.
 Morgan, W. P., 189.
 Morgenthaler, O., 233.
 Morgenthau, H., Jr., 737.
 Morison, F. L., 127, 880.
 Morley, L. C., 586.
 Morofsky, W. F., 559, 834.
 Morrell, J. C., 876.
 Morrill, A. W., Jr., 690.
 Morris, H. F., 43.
 Morris, M. L., 277.
 Morris, R. S., 314.
 Morris, S., 572.
 Morris, S. D. D., 772.
 Morris, V. H., 38.
 Morrison, C. A., 146.
 Morrison, F. B., 90, 405.
 Morrow, K. S., 848.
 Morse, F. W., 23, 635, 652.
 Morse, W. J., 644.
 Mortensen, M., 98.
 Mortenson, W. P., 881.
 Mortimer, G. B., 791.
 Morton, R. A., 150, 320, 630, 759.
 Morton, W. A., 448.
 Morwood, R. B., 529.
 Moses, B. D., 255.
 Moss, F. J., 708.
 Mottern, H. H., 618.
 Motts, G. N., 741.
 Moulton, H. G., 604.
 Mouriquand, G., 624, 758.
 Moutia, A., 686.
 Mowry, H., 209, 660.
 Muckenfuss, R. S., 424.
 Mucklow, G. F., 284.
 Mueller, W. S., 705.
 Muesebeck, C. F. W., 398, 399.
 Muggeridge, J., 549.
 Mugrage, E. R., 753, 754.
 Muller, J. F., 182.
 Mumford, C. W., 89, 846.
 Mumford, F. B., 187.
 Munce, T. E., 273.
 Mundkur, B. B., 373.
 Munger, F., 240.
 Munkwitz, R. C., 574.
 Munn, M. T., 210.
 Munro, G. H., 495.
 Munro, H. K., 686.
 Munro, J. W., 385.
 Munro, S. S., 196.
 Munsell, H. E., 308.
 Murata, K., 415.
 Murnane, D., 581, 589.
 Murneek, A. E., 341.
 Murphy, H. C., 60.
 Murphy, J. B., 436.
 Murphy, P. A., 815.
 Murray, C., 104, 110, 719.
 Murray, H. L., 670.
 Murray, J. M., 787.
 Murray, K. A. H., 737.
 Murray, W. G., 131, 134, 442, 603.
 Murray, W. T., 615.
 Musbach, F. L., 791, 798.
 Musgrave, A., 549.
 Muskett, A. E., 817.
 Mussehl, F. E., 845, 847.
 Musso, J. O., 878.
 Myers, L., 645.
 Myers, P. B., 3, 16, 159.
 Myers, V. C., 904.
 Nabours, R. K., 193.
 Nachtsheim, H., 509.
 Nagle, M. E., 363.
 Nagler, F. A., 332.
 Nagy, I. E., 602.
 Naik, R. N., 426, 434.
 Nair, J. H., 852.
 Nakamura, H., 229.
 Nakamura, J., 421.
 Nakata, K., 66.
 Nakazima, S., 690.
 Naquin, E. E., 206, 516.
 Narayan Rao, M. A., 858.
 Narayanan, T. R., 784.
 Natividade, J. V., 212.
 Nattrass, R. M., 542.
 Navarrete, J. B., 332.
 Navez, A. E., 187.
 Navias, L., 323.
 Neal, D. C., 645.
 Neal, W. M., 257, 258, 413, 563.
 Neale, S. M., 315.
 Neatby, K. W., 222, 812.
 Neave, F., 398.
 Nebel, B. R., 29, 347.
 Neeb, G. A., 516.
 Nehring, K., 340.
 Neill, J. M., 172.
 Neiswander, C. R., 72.
 Neiswander, R. B., 72, 78.
 Neitz, W. O., 107, 420.
 Nel, R. G., 555.
 Nelson, A. L., 791.
 Nelson, C. I., 27.
 Nelson, E. M., 618, 775.
 Nelson, J. B., 279.
 Nelson, P., 288, 737.
 Nelson, P. M., 48, 89, 148.
 Nelson, R., 532, 676.
 Nelson, R. H., 688.
 Nelson, V. E., 620.
 Némec, B., 811, 814.
 Netsch, W. A., 406.
 Netter, R., 467, 631.
 Neumann, R., 517.
 Neumann-Kleinpaul, K., 710, 711.
 Neuville, P., 517.
 Neveling, C. H., 450.
 Nevens, W. B., 141, 463, 840.
 Nevodovskaia, A. G. S., 672.
 Newcomer, E. J., 546, 684, 826.
 Newell, W., 317.
 Newhall, A. G., 61.
 Newhouse, N. P., 81.
 Newman, H. H., 344.
 Newman, J. E., 320.
 Newman, J. S., 162.
 Newman, L. H., 320, 796.
 Newham, E. V., 13.
 Newsom, I. E., 109, 433, 478.
 Newton, C. L., 749.
 Newton, J. H., 397.
 Newton, M., 63, 64.
 Newton, R. C., 85.
 Newton, W., 223, 375, 811, 823.
 Nezwetaïeff, N. W., 718.
 Nicholas, H. O., 170.
 Nicholas, J. E., 405.
 Nicholls, H. M., 388.
 Nichols, J. E., 315.
 Nichols, N. N., 572.
 Nichols, P. F., 757.
 Nicholson, A. J., 543.
 Nicol, H., 320, 793.
 Nicolaisen, N., 211.
 Nicolet, B. H., 4, 485.
 Nicoll, J. L., 206.
 Nieberle, K., 578, 579, 580, 710.
 Nielsen, C., 756.
 Nieschulz, O., 717.
 Nightingale, G. T., 160.
 Nijdam, F. E., 192.
 Nijhawan, S. D., 17.
 Niklitschek, A., 216.
 Nilsson, G., 877.
 Nims, B., 751.

- Nishigaki, N., 181.
 Nisikado, Y., 680.
 Nitsche, O., 579, 710.
 Nodder, C. R., 315.
 Nohmi, S., 594.
 Nolen, R. E., 221.
 Noll, C. F., 794.
 Nöller, W., 544.
 Nordby, J. E., 406, 590.
 Norman, A. G., 645, 771.
 Norman, D. B., 402, 403, 404.
 Norris, L. C., 90.
 North, D. S., 534, 535.
 Norton, E. A., 778.
 Nowell, R. I., 607.
 Nussbag, W., 579.

 Obén, M., 516.
 Obenshain, S. S., 912.
 O'Brien, J. R. P., 326, 902.
 O'Connor, M. G., 682.
 Odén, S., 877.
 Odland, T. E., 205.
 O'Flaherty, F., 695.
 Ogrizek, A., 701.
 Ohdake, S., 6.
 Okada, Y., 682.
 O'Kane, W. C., 385.
 O'Kelly, J. F., 514.
 Okey, R., 752.
 Olcott, H. S., 759.
 Olcott, M. T., 604.
 Oldham, J. N., 695.
 O'Leary, D. K., 61.
 Olin, W. H., 910.
 Oliver, W. A., 601.
 Olmedo, I. H., 561.
 Olney, L. A., 324.
 Olsen, J. C., 122.
 Olsen, J. W., 122.
 Olsen, N. A., 601.
 Olson, C., Jr., 595.
 Olson, H. C., 574, 575, 706.
 Olson, T. M., 100.
 Oltman, R. E., 772.
 Ömer, H., 710.
 Omlin, A., 588.
 O'Neal, A. M., 45, 516.
 Onuma, F., 69.
 Opitz, 178.
 Oppenheimer, H. R., 525.
 Oppermann, T., 577.
 O'Roke, E. C., 267, 281.
 O'Rourke, C. E., 120.
 Orr, F. H., Jr., 279.
 Orr, J. L., 650.
 Orr, W., 33.
 Orten, J. M., 753, 754, 763.
 Ortlepp, R. J., 420.
 Ortloff, H. S., 524.
 Orton, C. R., 215, 480.
 Orwin, C. S., 288.
 Osborn, A., 525.
 Osborn, H., 623.
 Osborn, H. F., 344.

 Osborn, W. M., 205, 356.
 Oserkowsky, J., 637.
 Osima, Y., 151.
 Oskamp, J., 54.
 Osterberger, B. A., 80, 81, 836.
 Osterhout, W. J., 188.
 Ostrem, C. T., 620.
 Ostrolenk, B., 450.
 Osugi, S., 181.
 Osvald, H., 186.
 Ott, E., 9.
 Outhouse, J., 747.
 Overholser, E. L., 470, 820.
 Overholt, V. L., 116.
 Overley, F. L., 820, 880.
 Overpeck, J. C., 362.
 Overseth, O. E., 184.
 Owens, J. S., 518.
 Oxer, D. T., 276.
 Oyama, S., 421.

 Pacheco, G., 271.
 Pack, A. N., 660.
 Packendorff, K., 9.
 Paddock, F. B., 80.
 Paden, W. R., 187.
 Padwick, G. W., 530.
 Page, H. J., 782.
 Page, J. W., 469.
 Paget, P., 753.
 Pahl, M., 710.
 Pailthorp, R. R., 55.
 Paine, F. D., 120.
 Paine, H. S., 323.
 Paine, S. G., 531.
 Painter, R. H., 232, 242, 547.
 Painter, W. E., 576.
 Paisley, S., 465.
 Pallaske, G., 710.
 Palmer, C. C., 98.
 Palmer, L. O., 732.
 Palmer, L. S., 258, 263, 762, 853.
 Palmer, R., 708.
 Palmer, R. C., 537.
 Palmer, V. E., 435.
 Palo, M. A., 387.
 Pancoast, H. M., 26.
 Panisset, L., 111.
 Pantanelli, E., 320.
 Pappenheimer, A. M., 719.
 Pardo, J. H., 516.
 Parfitt, E. H., 125.
 Park, J. B., 39.
 Park, J. W., 55, 523.
 Park, O. W., 71, 72, 87.
 Park, S. E., 277, 431.
 Parker, D. L., 86, 398.
 Parker, E. R., 522, 806.
 Parker, H. L., 697.
 Parker, H. N., 708, 709.
 Parker, J. H., 232.
 Parker, J. R., 76.
 Parker, M. M., 653.

 Parker, R. G., 821.
 Parker, R. L., 232, 240.
 Parker, R. R., 400, 712, 869.
 Parker, W. B., 685.
 Parker, W. H., 201.
 Parkes, A. S., 34.
 Parkhurst, R. T., 125, 509, 569, 570, 704.
 Parks, T. B., 752.
 Parrish, C. F., 442.
 Parrot, L., 587.
 Parrott, P. J., 236, 240.
 Parsons, B., 61, 369.
 Parsons, D. E., 283.
 Parsons, H., 890.
 Parsons, M. S., 444.
 Partridge, N. L., 56, 522.
 Paschall, A. H., 15.
 Pasquier, R. du, 822.
 Passmore, R., 902.
 Patch, A. J., 158, 621.
 Patch, L. H., 78.
 Paton, R. R., 57.
 Patrick, A. L., 370, 636.
 Patterson, F. D., 104, 719.
 Patterson, H. J., 766.
 Patteson, G. W., 912.
 Patton, C. A., 13.
 Patton, M. B., 143.
 Patty, R. L., 438.
 Paul, B. H., 661.
 Pavarino, G. L., 676.
 Pavlovsky, G., 602.
 Pawlowsky, E. N., 558.
 Payne, L. F., 249, 570.
 Payne, N. M., 247.
 Pchakadze, G., 787.
 Pearson, A. M., 244.
 Pearson, F. A., 127, 295, 296.
 Pearson, H. M., 805.
 Pearson, J. H., 141, 746.
 Pearson, O. H., 210.
 Pearson, T. G., 381.
 Peck, E. C., 218.
 Peck, M., 126, 127.
 Peet, L. J., 143, 909.
 Peirce, F. T., 43.
 Peirce, L. L., 78.
 Pelckmann, K., 710.
 Pelham, R. A., 320.
 Pelley, R. H. Le, 551.
 Peltier, G. L., 64, 531.
 Pember, F. R., 183.
 Pendray, G., 264.
 Penhallow, R., 206.
 Pepper, O. H. P., 709.
 Percival, G. P., 353, 385, 502.
 Perdrau, J. R., 272.
 Perkins, A. E., 99, 101.
 Perkins, S. O., 15.
 Perkins, W. F., 318.
 Perris, N. M., 728.
 Perry, E. O. V., 307.
 Perry, W. M., 520.

- Pertountzi, C., 602.
 Pessin, L. J., 58.
 Petch, C. E., 547, 557.
 Petch, T., 372.
 Peters, R. A., 151, 326, 902.
 Peters, W. H., 405.
 Peterson, A. G., 610.
 Peterson, G. M., 444, 883.
 Peterson, W., 444.
 Peterson, W. E., 850.
 Peterson, W. H., 166, 771, 890.
 Petheram, H. D., 661.
 Petherbridge, F. R., 695.
 Petit, G., 229.
 Petrini, E., 601.
 Petroff, S. A., 720.
 Pett, L. B., 166.
 Pettey, F. W., 557, 686.
 Pettinger, N. A., 41.
 Petty, B. K., 78.
 Pfeiffer, H., 188.
 Pfund, M., 890.
 Phelps, F. P., 517.
 Philip, C. B., 382, 400, 712.
 Phillips, C. E., 37.
 Phillips, E. F., 87, 385, 386, 686.
 Phillips, G. A., 216.
 Phillips, H., 315.
 Phillips, M., 494.
 Phillips, P. H., 414, 839.
 Phillips, S. W., 497.
 Phillips, T. G., 174, 353, 502.
 Phillips, V. W., 95.
 Phillips, W. J., 829.
 Philp, G. L., 655.
 Phipps, C. R., 244, 364, 385, 394, 622.
 Pickard, J. A., 323.
 Pickens, E. M., 864.
 Pickett, B. S., 48.
 Pickett, W. F., 209, 212.
 Pictet, A., 32.
 Pierce, H. B., 146.
 Pierce, M. S., 146.
 Pierce, W. H., 810.
 Pierre, W. H., 19, 20, 198.
 Pieters, A. J., 320.
 Pigott, M. G., 149, 150.
 Pike, C. W., 728.
 Pinckney, R. M., 329.
 Pincus, G., 196, 642.
 Pinner, M., 711.
 Pinto da Fonseca, J., 550.
 Pirie, A., 108.
 Pirie, N. W., 484.
 Pirnie, M., 330.
 Pirovano, A., 28.
 Pistor, W. J., 863.
 Pittman, H. A., 537.
 Pkhakadze, G. M., 787.
 Plagge, H. H., 48.
 Plastridge, W. N., 869.
 Platt, S. S., 762.
 Platt, W., 462.
 Plessis, A. F. du, 450.
 Plice, M. J., 337.
 Plimmer, R. H. A., 303.
 Plimmer, V. G., 303.
 Plummer, B. E., 437.
 Plummer, C. C., 245.
 Poesch, G. H., 807.
 Poey, F., 516.
 Poggendorff, W., 44.
 Pohl, G., 710.
 Pohlman, G. G., 19, 20.
 Polivka, J. B., 72, 832.
 Polzin, H., 839.
 Pomeroy, C. S., 53, 660.
 Pommer, A., 580.
 Ponikowski, W., 602.
 Ponto, S. A. S., 400.
 Poole, E. J., 79.
 Poole, R. F., 226, 658.
 Pope, J. D., 289.
 Pope, M. N., 26.
 Pope, T. H., 148, 752.
 Pope, W. T., 524, 652.
 Popovici, I., 582.
 Popp, H. W., 506, 782.
 Popp, W., 811.
 Porter, A. M., 767.
 Porter, B. A., 652.
 Porter, D. A., 266, 267, 278.
 Porter, D. R., 670.
 Porter, R. H., 37, 60.
 Posey, C. J., 723.
 Posrednik, 578.
 Posson, D. D., 146.
 Potapov, A. I., 18.
 Potter, G. F., 364, 385, 445.
 Potter, M. T., 465, 470, 758.
 Potts, C. G., 697.
 Poulson, E. N., 334, 777.
 Poulter, A. A., 644.
 Powashenko, I. E., 579.
 Powe, W. A., 517.
 Powell, J. K., 451.
 Powell, L. B., 176, 178.
 Powell, M. E., 420.
 Powers, H. A., 778, 806.
 Powers, L., 201, 347.
 Prasad, T., 295.
 Prát, S., 187.
 Pratt, A. D., 480.
 Prebble, M. L., 835.
 Pregl, F., 170.
 Pressley, E. H., 46, 286.
 Preston, J. M., 315.
 Pretorius, W. J., 450.
 Price, H. B., 296.
 Price, R. M., 425.
 Price, W. V., 419, 848.
 Prickett, P. S., 264.
 Priestley, F. W., 423.
 Prince, A. L., 182.
 Prince, F. S., 353, 502.
 Pringsheim, E. G., 341.
 Prissick, F. H., 430.
 Probert, M. E., 373.
 Procter, J., 251.
 Proebsting, E. L., 799.
 Pröscholdt, O., 580.
 Prouty, C. C., 265.
 Pruess, L. M., 166, 771.
 Pucher, G. W., 165, 771.
 Pugh, A. J., 160.
 Pugh, C. E. M., 486.
 Pugh, G. W., 667.
 Pugsley, L. I., 311.
 Pullar, E. M., 110.
 Purves, C. M., 644.
 Purvis, E. R., 910.
 Pussard, R., 239.
 Putman, W. L., 548.
 Putnam, G. W., 708.
 Pyle, C. A., 265.
 Pyne, G. T., 852.
 Quanger, H. M., 372.
 Quayle, H. J., 384, 690.
 Quayle, W. L., 92.
 Queen, F. B., 267.
 Querci, O., 239, 690.
 Quick, A. J., 620, 762.
 Quigley, G. D., 411.
 Quin, A. H., Jr., 432.
 Quinlan, J., 421.
 Quinn, E. J., 466.
 Quinn, J. D., 706.
 Quintus, P. E., 442.
 Quiroga, S. S., 860.
 Quisenberry, K. S., 347.
 Racicot, H. N., 376, 378.
 Rădulescu, I., 536.
 Rae, J., 759.
 Raj, D., 699.
 Rajagopalan, V. R., 583.
 Raleigh, W. P., 373.
 Rall, Iu. (G.), 248.
 Ralli, E. P., 468.
 Ramada, L. A., 160.
 Ramos, R. M., 517.
 Ramsay, A. A., 562, 580.
 Ramsay, G. C., 393.
 Ramsbottom, J., 372.
 Ramser, C. E., 438.
 Ramsey, R. J., 417, 850, 854.
 Rand, F. V., 669.
 Randoin, L., 631, 752.
 Randolph, J. W., 879.
 Randolph, L. F., 40.
 Rands, R. D., 535.
 Rankin, H. W., 57, 61.
 Rankin, W. H., 341, 369.
 Ranson, R. M., 32.
 Rao, C. J., 358.
 Rao, K. S. S., 785.
 Rao, M. A. N., 858.
 Rao, P. K., 29.
 Rao, T. N., 784.
 Raper, C. L., 601.
 Rapport, D., 464.
 Rapport, V. A., 888.
 Rashevsky, N., 323.
 Rasmussen, E. J., 364.
 Rasmussen, M. P., 127.
 Rassweiler, G. M., 121.

- Rastegaieff, E. F., 594, 718.
 Rather, H. C., 572.
 Rau, O. M., 728.
 Rau, P., 560.
 Rauchenstein, E., 445.
 Raup, H. M., 681.
 Rawlins, T. E., 673.
 Ray, S. N., 169, 902, 904.
 Raymond, A. L., 166.
 Rayner, M. C., 343.
 Rea, H. E., 504, 532.
 Read, F. M., 538.
 Read, L. H., 201.
 Reader, V., 902.
 Recknagel, A. B., 217.
 Record, P. R., 90, 115, 839.
 Records, E., 277.
 Reddick, D., 61.
 Reddy, C. S., 37, 60.
 Redfield, A. C., 383.
 Reed, C. D., 176, 332, 333, 776.
 Reed, C. O., 116.
 Reed, F. D., 406, 511, 569.
 Reed, G. B., 711.
 Reed, G. M., 663.
 Reed, H. J., 157, 789, 909.
 Reed, H. W., 728.
 Reed, T. R., 176, 332.
 Reed, W. D., 690.
 Reeher, M. M., 692.
 Reerink, E. H., 151.
 Rees, C. W., 267, 269.
 Rees, J., 644.
 Reeves, R. G., 203, 345.
 Reichel, J., 275.
 Reichert, I., 676.
 Reid, K. M., 256.
 Reid, W. H. E., 420, 574, 576, 855.
 Reifenberg, A., 320.
 Reinecke, O. S. H., 536.
 Reineke, L. H., 525.
 Reinhard, H. J., 836.
 Reinoehl, F. W., 443, 604.
 Reis, F., 173.
 Reitz, L. P., 319.
 Remington, R. E., 320.
 Remlinger, P., 860, 867.
 Remy, E., 153, 463.
 Rendel, T. B., 730.
 Rendle, T., 748.
 Renne, R. R., 606.
 Reppin, K., 578, 710.
 Rettger, L. F., 5, 281.
 Reuszer, H. W., 767.
 Revzan, D. A., 609.
 Reydon, G. A., 228.
 Reynolds, E. B., 43.
 Reynolds, R. J. W., 11.
 Reynolds, S. P., 601.
 Reynolds, S. R. M., 643.
 Reznak, R., 490.
 Rhind, D., 373, 784.
 Rhines, C. M., 165.
 Rhoads, A. S., 221.
 Rhoads, C. P., 470.
 Rhodes, E., 379.
 Rhys, I., 599.
 Rhys, I. W., 569.
 Rich, M. L., 314.
 Richards, B. L., 224.
 Richards, E. H., 734.
 Richards, O. W., 390.
 Richardson, A. E. V., 290.
 Richardson, C. H., 71, 72, 75, 98, 238, 244.
 Richardson, E. G., 336.
 Richardson, H. H., 74, 83, 551, 688, 824.
 Richardson, J. E., 477, 617, 898, 899.
 Richardson, L. R., 152, 595.
 Richey, F. D., 644.
 Richman, M. W., 49.
 Richmond, R. G., 87.
 Richters, 578, 579, 710.
 Ricks, G. L., 212.
 Riddell, W. H., 257.
 Ridley, H. N., 187.
 Riedmüller, L., 712, 713.
 Ries, L. W., 875.
 Ries, V. H., 807.
 Rife, D. C., 32.
 Rijst, M. P. J. van der, 151.
 Riker, A. J., 810.
 Riley, H. W., 116.
 Riley, O. N., 49.
 Rimington, C., 421.
 Rinear, E. H., 445.
 Rinehart, E. F., 253.
 Ringrose, A. T., 90.
 Ripley, L. B., 78.
 Ripperton, J. C., 633, 643, 652, 778, 793, 806.
 Ritchey, G. E., 199, 248.
 Ritchie, A. H., 234.
 Ritter, K., 612.
 Rittinger, F. R., 305.
 Ritzman, E. G., 348, 406.
 Rivarola, J. B., 273.
 Rivers, T. D., 382.
 Roark, R. C., 73, 683.
 Robbins, E. T., 405.
 Robbins, F. S. R., 892.
 Robbins, W. R., 911.
 Roberts, E., 862.
 Roberts, E. H., 908.
 Roberts, E. V., 525.
 Roberts, F. H. S., 276, 593, 717.
 Roberts, G. A., 585.
 Roberts, L. J., 892.
 Roberts, O. C., 384, 652.
 Roberts, R. A., 834, 837.
 Roberts, R. C., 516.
 Roberts, R. H., 798.
 Roberts, R. S., 423.
 Robertson, A., 719.
 Robertson, A. H., 708.
 Robertson, D., 320.
 Robertson, D. W., 29, 344, 363.
 Robertson, E. C., 313.
 Robertson, H. F., 797.
 Robertson, J. H., 792.
 Robertson, L., 130, 136.
 Robey, O. E., 685.
 Robinson, A. D., 581.
 Robinson, B. B., 621, 646.
 Robinson, E. M., 114, 420.
 Robinson, J. L., 37, 89.
 Robinson, R., 151.
 Robinson, R. H., 73.
 Robinson, T. R., 652.
 Robinson, V. C., 838.
 Robinson, W., 83.
 Robison, R., 307.
 Robison, W. L., 90.
 Robotka, F., 127.
 Robschelt-Robbins, F. S., 892.
 Roche, B. H., 839, 848.
 Roche, R., 516.
 Rochester, G. H., 662.
 Rockwood, L. P., 692.
 Roddy, W. T., 695.
 Rodriguez, A. G., 53.
 Rodríguez, J. P., 646.
 Rodriguez-Molina, R., 267.
 Roehrich, O., 315.
 Roemmele, O., 578.
 Rogers, H. W., 90.
 Rogers, J. S., 558.
 Rogers, L. A., 705.
 Rogers, R. H., 128, 882.
 Rogers, W. S., 654.
 Rohrbeck, W., 775.
 Röhrer, H., 710.
 Rohwer, C., 722, 871.
 Rolfs, A. R., 546.
 Roman, G., 582.
 Romanoff, A. J., 702.
 Romanoff, A. L., 255, 702.
 Roodenburg, J. W. M., 27.
 Rosbrook, M. I., 315.
 Rose, E. R., 752.
 Rose, J. K., 178.
 Rose, M. S., 145, 749.
 Rose, W. B., 269.
 Rose, W. C., 144, 145.
 Rosebury, T., 475.
 Rosell, J. M., 274, 715.
 Rosen, H. R., 68, 369, 674.
 Rosenberg, H., 579.
 Rosenblatt, M., 755.
 Rosenfeld, A. H., 516.
 Ross, G., 206.
 Ross, G. R., 392.
 Ross, I. C., 430.
 Ross, J., 475.
 Ross, J. D., 728.
 Ross, J. H., 543.
 Ross, J. R., 313.
 Ross, R. C., 451.
 Ross, W. A., 547, 548.
 Rossi, G. De', 500.
 Rost, C. O., 329.
 Rouch, J., 13.
 Routh, I. B., 630.
 Rowe, H. B., 737.

- Rowland, F. E., 120.
 Rowland, V. C., 314.
 Rowlands, I. W., 352.
 Rowntree, J. I., 895.
 Roy, A. C., 868.
 Royer, K. M., 708.
 Rozman, D., 291.
 Rudd, V. E., 364.
 Rudolfs, W., 389.
 Ruehe, H. A., 265, 417, 854.
 Ruehle, G. D., 221.
 Ruhland, W., 187.
 Ruhnke, G. N., 498.
 Rule, G. K., 768.
 Rumiantsev, B. F., 787.
 Rumjancev, B., 787.
 Runnels, H. A., 38, 61, 374.
 Rupel, I. W., 705, 839, 848.
 Ruprecht, R. W., 178, 199, 209.
 Rüscher, 580.
 Rüscher, W., 711.
 Russell, B. A., 291, 886.
 Russell, E. J., 449.
 Russell, E. W., 337.
 Russell, J. (Sir), 319.
 Russell, P. F., 242, 393.
 Russell, R. C., 222.
 Russell, W. C., 620, 703, 705.
 Rust, H. J., 685.
 Rusznyák, S., 331.
 Ruyter de Wildt, J. C. de, 755.
 Ryadno, M. T., 779.
 Ryan, D. G., 120.
 Rygh, A., 10.
 Rygh, O., 10, 772.

 Sachs, W. H., 359.
 Sackett, W. G., 159.
 Sadler, W., 263, 264.
 Saeger, A., 25.
 Sagen, H. E., 810.
 Saiki, S., 352.
 Saint, S. J., 517.
 St. John, J. L., 774, 845.
 St. Julian, R. R., 144, 145.
 Saito, H., 70.
 Sakita, S., 664.
 Salaman, R. N., 201.
 Salgado, M. L. M., 336.
 Salmon, E. S., 222, 227, 375, 815, 821.
 Salmon, M. R., 183.
 Salmon, S. C., 530, 650.
 Salter, R. M., 16, 38, 116.
 Samarzeff, A. A., 580, 711.
 Samec, M., 323.
 Sampson, J., 715.
 Sampson, K., 666.
 Sampson, M. M., 759.
 Samuel, G., 672.
 Samuels, L. T., 176.
 Sanborn, R., 641.
 Sandberg, E., 419.
 Sandera, K., 517.

 Sanders, D. A., 265, 910.
 Sanders, J. T., 288, 614, 737.
 Sanders, K. B., 503.
 Sanders, R., 890.
 Sanderson, A. R., 379.
 Sanderson, D., 299, 300.
 Sando, C. E., 368, 655.
 Sandsten, E. P., 478.
 Sanford, G. B., 535, 666, 670.
 Sanford, S. V., 159.
 Sankaran, G., 761.
 Sansum, W. D., 905.
 Saphir, N. R., 642.
 Sarles, M. P., 267.
 Sarles, W. B., 416.
 Šaseci, O., 610.
 Sassuchin, D. N., 248.
 Sater, L. E., 143.
 Sater, V. E., 909.
 Sato, M., 415.
 Satoh, S., 25.
 Satterthwait, A. F., 85, 391.
 Saunders, A. R., 814.
 Sauve, E. C., 597.
 Savage, A., 581.
 Savage, E. S., 99.
 Savage, J. R., 72.
 Savage, W. G., 304, 897.
 Savastano, G., 372, 540.
 Savenkov, A. N., 233.
 Saville, R. J., 128.
 Săvulescu, T., 536.
 Sawyer, W. A., 149, 150.
 Sawyer, W. H., 652.
 Sayre, C. B., 211.
 Sayre, J. D., 38.
 Saywell, L. G., 52.
 Scanlan, J. J., 141.
 Scaramuzza, L. C., 244, 556.
 Schaars, M. A., 881.
 Schafer, B., 216.
 Schaffer, J. M., 106.
 Schaffnit, E., 372.
 Schaible, P. J., 99.
 Schäle, E., 580.
 Schalit, R., 351, 352.
 Schalk, A. F., 104.
 Schalscha, R. von, 580.
 Schander, R., 65.
 Scheitz, A., 343.
 Scherffel, A., 372.
 Schermer, S., 640.
 Scheuber, J. R., 420.
 Schiedewitz, H., 331.
 Schiemann, E., 29.
 Schiff, L., 314.
 Schilberszky, K., 533.
 Schlingman, A. S., 111.
 Schlotthauer, C. F., 437, 863.
 Schlumberger, O., 775.
 Schlyter, R., 125.
 Schmey, 580.
 Schmid, F., 544.
 Schmidt, C. L. A., 166, 483.

 Schmitz, H., 665.
 Schmulewitsch, A. I., 718.
 Schnauder, F., 579.
 Schneider, J. E., 275.
 Schoene, W. J., 238, 386, 689.
 Schoening, H. W., 276.
 Schoenmann, L. R., 601.
 Schoevers, T. A. C., 69.
 Schofield, R. K., 490.
 Schollenberger, C. J., 16.
 Schoop, G., 591, 716, 717.
 Schostakowitsch, W. B., 175.
 Schoth, H. A., 354.
 Schouppé, K., 710.
 Schoute, E., 81.
 Schowengerdt, G. C., 55.
 Schrader, A. L., 655, 801.
 Schread, J. C., 246.
 Schreiber, H., 517.
 Schreiner, O., 516.
 Schrick, J. A., 493, 647.
 Schröder, V. N., 642.
 Schroeder, H. O., Jr., 400.
 Schrumpf, W. E., 445.
 Schultz, O., 578.
 Schultz, T. W., 126, 131, 450, 603, 611, 740.
 Schultze, M. O., 839.
 Schurawleff, A., 579.
 Schuster, G. L., 37.
 Schutt, C. D., 90.
 Schütt, G., 719.
 Schutte, D. J., 450.
 Schuurman, G. J., 450.
 Schwantes, A. J., 123.
 Schwaradt, H. H., 243, 835.
 Schwarte, L. H., 327.
 Schwarz, M., 710.
 Schwerdtfeger, F., 233.
 Scofield, C. S., 117.
 Scott, E., 708.
 Scott, F. T., 73.
 Scott, H. M., 249, 847.
 Scott, J. M., 708.
 Scott, J. P., 265, 866.
 Scott, J. W., 267.
 Scott, R. C., 668.
 Scurti, F., 676.
 Seamans, A. E., 789, 807, 839, 909.
 Seamans, H. L., 548.
 Searle, A. B., 323.
 Searls, E. M., 825.
 Sears, F. C., 652.
 Secor, A., 126.
 Secrest, E., 57, 58.
 Seddon, H. R., 273, 557, 580, 713.
 Seelemann, M., 579.
 Seeley, E., 387.
 Segal, B., 73.
 Segler, G., 879.
 Seidenberg, S., 595.
 Seifert, G., 710.
 Seifried, O., 710.
 Seín, F., Jr., 535.

- Selye, H., 350.
 Semple, A. T., 354, 644.
 Sen, K. C., 868.
 Sen, K. R., 41.
 Sen, S. K., 861.
 Sendroy, J., Jr., 171, 172.
 Sengbusch, R. v., 521.
 Senner, A. H., 124, 157.
 Serfontein, P. J., 847.
 Sergeant, E., 587.
 Serrano, F. B., 387.
 Serrano, L. A., 50.
 Servakis, G., 602.
 Sessions, A. C., 636.
 Setterfield, H. E., 99.
 Seuffert, R. W., 579.
 Severin, H. H. P., 554, 677.
 Severson, A., 568.
 Sexton, H. D., 283.
 Seybold, A., 343.
 Seymour, A. C., 480.
 Shahan, M. S., 587.
 Shamel, A. D., 53, 524, 652, 660.
 Shanklin, J. A., 358.
 Sharga, U. S., 553.
 Shariff, M. Y., 78.
 Sharkey, T. P., 235.
 Sharp, P. F., 256, 571.
 Sharpless, G. R., 895.
 Shaw, A. O., 412.
 Shaw, D. D., 463.
 Shaw, F. J. F., 795.
 Shaw, H. R., 206.
 Shaw, J. K., 652.
 Shaw, J. N., 109.
 Shaw, P. A., 436.
 Shaw, R. N., 596.
 Shaw, W. M., 18, 503.
 Shchavinskaja (Shchavinskaya), S. A., 508.
 Shealy, A. L., 248.
 Shear, G. M., 818.
 Shear, S. W., 883.
 Shearer, G. D., 105.
 Shearer, P. S., 89, 408, 565.
 Shedd, C. K., 732.
 Sheets, E. W., 405, 697, 911.
 Sheets, O., 763.
 Shekhalevich, G., 287.
 Shelton, F. A., 503.
 Shelton, J. E., 868.
 Shemenesky, R., 361.
 Shepard, H. H., 824.
 Shepard, J. B., 705.
 Shepherd, G., 131, 456, 603.
 Shepherd, G. S., 127.
 Shepperd, J. H., 568.
 Sherman, 3d, F., 240, 547.
 Sherman, H. C., 472, 890, 902.
 Sherman, J. E., 314.
 Sherman, L. W., 49.
 Sherman, R. T., 167.
 Sherman, R. W., 127.
 Sherman, W. A., 651.
 Sherman, W. C., 890.
 Sherwood, R. M., 95.
 Shibata, K., 391.
 Shillinger, J. E., 271, 864.
 Shimizu, R., 105.
 Shimomura, K., 421.
 Shipley, P. G., 400.
 Shippy, W. B., 221.
 Shirley, H. L., 217.
 Shive, J. W., 500, 501, 524, 636.
 Shoemaker, J. S., 48.
 Shoeman, J. D., 432.
 Shope, R. E., 266.
 Shreve, F., 180.
 Shrewsbury, C. L., 405.
 Shrikhande, J. G., 185.
 Shropshire, L. H., 385.
 Shull, C. A., 188, 341, 638.
 Shull, W. E., 828.
 Shultz, H., 303.
 Siebert, F., 8.
 Siegler, E. H., 240.
 Sieglinger, J. B., 205, 514.
 Siehrs, A. E., 616, 619.
 Sieling, D. H., 847.
 Sievers, F. J., 763.
 Silberman, A. K., 4.
 Silver, E. A., 116.
 Silver, J. C., 389.
 Sim, R. J., 73.
 Simkins, C. S., 349.
 Simmons, J. S., 709.
 Simmons, P., 390.
 Simms, B. T., 267.
 Simonatti, E., 273.
 Simonnet, H., 752.
 Simpson, G. W., 385.
 Simpson, J. C. E., 151.
 Simpson, L. J., 547.
 Simpson, M. E., 511.
 Simpson, W. M., 235.
 Sims, A. J., 768.
 Sinden, J. W., 61.
 Singh, B., 868.
 Singh, C., 699.
 Singh, D., 17.
 Singh, H., 705, 795.
 Singleton, H. P., 356.
 Sisesti, G. I., 602.
 Sison, P., 556.
 Sitton, B. G., 806.
 Skelley, W. C., 255, 406, 408, 599, 911.
 Skidmore, L. V., 277.
 Skinner, J. H., 157, 841.
 Skinner, J. J., 56, 205, 359, 645.
 Skomorochow, A. L., 579.
 Skovholt, O., 462.
 Skovsted, A., 638.
 Slack, A. J., 262.
 Slagle, E. A., 160.
 Slate, G. L., 369.
 Slate, W. L., 157, 317, 621.
 Slatter, E. E., 108, 277.
 Slesman, J. P., 72.
 Slocum, G., 776.
 Slocum, R. R., 704.
 Small, T., 224, 226.
 Smallfield, H. A., 707.
 Smee, C., 555.
 Smirnow, G. G., 585.
 Smith, A. C., 256.
 Smith, A. E., 605.
 Smith, A. K., Jr., 648.
 Smith, C. E., 824.
 Smith, C. R., 242.
 Smith, E. E., 460.
 Smith, E. H., 767.
 Smith, E. L., 631.
 Smith, F. B., 37, 338, 496.
 Smith, F. F., 688, 824.
 Smith, G. E. P., 720.
 Smith, G. F., 330.
 Smith, G. G., 903.
 Smith, G. M., 653.
 Smith, G. P., 694.
 Smith, H. D., 697.
 Smith, H. E., 427, 713.
 Smith, J., 583.
 Smith, J. A. B., 487.
 Smith, J. H., 372.
 Smith, L., 477.
 Smith, L. H., 778.
 Smith, L. R., 15.
 Smith, M. C., 155, 251, 252.
 Smith, M. E., 758, 760.
 Smith, M. N. L., 775.
 Smith, O., 360.
 Smith, R. C., 232, 237, 301, 825.
 Smith, R. E., 541.
 Smith, R. H., 685.
 Smith, R. M., 720.
 Smith, R. S., 778.
 Smith, S., 10.
 Smith, S. G., 472.
 Smith, S. L., 756.
 Smith, T., 427.
 Smith, T. L., 141.
 Smith, T. O., 90, 504.
 Smith, W. K., 639.
 Smock, R. M., 21, 48.
 Smyth, E. G., 836.
 Snapp, O. I., 232, 685.
 Snapp, R. R., 141.
 Snedecor, G. W., 405, 611.
 Snell, M. E., 643, 652.
 Snell, M. G., 405.
 Snell, R. S., 202.
 Snider, H. J., 207.
 Snodgrass, R. E., 545.
 Snow, C. P., 325, 772.
 Snyder, E. B., 156.
 Snyder, E. F., 12.
 Snyder, G. B., 652, 663.
 Snyder, G. H. S., 284.
 Snyder, J. C., 659.
 Snyder, L. H., 32, 508, 509.
 Snyder, R. M., 22.
 Snyder, W. C., 533, 670, 815.
 Sokolov, D. V., 681.
 Solomon, S. G., 719.

- Somerville, W., 39.
 Sommer, H. H., 707, 709, 848.
 Sommer, M., 348.
 Sonntag, M., 711.
 Sorber, D. G., 749.
 Sotola, J., 406.
 Southard, J. L., 906.
 Spafford, W. J., 840.
 Spamer, C. H., 450.
 Spangler, M. G., 723.
 Sparks, E. S., 288.
 Sparks, F. C., 576.
 Spaulding, E. H., 767.
 Speakman, J. B., 315.
 Spencer, D. A., 406, 697.
 Spencer, E. L., 524.
 Spencer, G. L., 806.
 Spencer, J., 34.
 Spencer, L., 262, 443, 709.
 Spencer, W. P., 194.
 Speyer, W., 831.
 Spies, J. R., 75.
 Spillman, W. J., 339.
 Spilman, R. F., 881.
 Spindler, L. A., 267, 432.
 Spinks, G. T., 799.
 Sponsler, O. L., 188.
 Sprague, C. S., 728.
 Sprague, G. W., 697.
 Sprehn, C., 572.
 Spruijt, F. J., 233, 687.
 Spurway, C. H., 328, 491.
 Squire, F. A., 548.
 Staar, G., 65.
 Stack, J. W., 621.
 Stafseth, H. J., 5.
 Stahl, A. L., 57, 209, 500, 501.
 Stahl, M. G., 450.
 Stahly, G. L., 324.
 Stakman, E. C., 63, 372.
 Standfuss, R., 710.
 Stang, A. H., 283.
 Stange, C. H., 265.
 Stanley, J., 396.
 Stanley, L., 765.
 Stanley, W. W., 73.
 Stansel, R. H., 43.
 Stanton, T. R., 205, 644.
 Starch, E. A., 444.
 Stare, F. J., 258, 753.
 Stark, A. L., 55.
 Stark, C. N., 709.
 Stark, M. E., 750.
 Starker, T. J., 218.
 Starr, G. H., 529.
 Starr, L. E., 480, 869, 870.
 Starr, S. H., 157.
 Stauber, B. R., 133.
 Stead, E. F., 544.
 Stear, J. R., 830.
 Stearns, L. A., 71, 81, 84.
 Stebnitz, V. C., 848.
 Steden, A., 602.
 Steele, H. A., 446, 603.
 Steele, J. G., 16.
 Steenbock, H., 630, 839, 890.
 Steensberg, V., 257.
 Steffanson, B., 387.
 Steigerwalt, G. F., 734.
 Stein, C. D., 718.
 Stein, S., 197.
 Stein, S. I., 512.
 Steinbauer, C. E., 211.
 Steiner, G., 69, 375, 681.
 Steiner, L. F., 831.
 Stepanenko-Nevodovskaja, A. G., 672.
 Stephens, D. E., 208.
 Stephens, P. H., 288, 292, 737.
 Stepp, W., 465.
 Stericker, W., 323.
 Stetson, H. T., 332.
 Stevens, F. D., 199.
 Stevens, G. A., 369.
 Stevens, H., 775.
 Stevens, J. C., 874.
 Stevens, N. E., 663.
 Stevens, O. A., 580.
 Stevenson, S. G., 631, 775.
 Steward, J. S., 105.
 Stewart, A. B., 334.
 Stewart, D., 752.
 Stewart, G. F., 571.
 Stewart, G. R., 206, 382.
 Stewart, J., 105, 400, 401.
 Stewart, K. E., 548.
 Stewart, W. L., 275, 276.
 Steyn, D. G., 110, 420, 421.
 Stickel, F. G., Jr., 451.
 Stickel, P. W., 660, 661.
 Stickney, F. S., 388.
 Stiebeling, H. K., 739.
 Stiles, G. W., Jr., 587.
 Stine, O. C., 881.
 Stirling, J. D., 851.
 Stirrett, G. M., 548.
 Stirrup, H. H., 531.
 Stitt, R. E., 202.
 Stoa, T. E., 203, 207, 362.
 Stockmayer, W., 711.
 Stockwell, C. W., 245.
 Stokdyk, E. A., 741.
 Stoker, H. M., 127, 298, 450.
 Stokes, J., Jr., 154.
 Stokes, W. E., 199, 209.
 Stone, A. A., 122.
 Stone, M. W., 84.
 Stone, W. E., 342.
 Storey, W. B., 524.
 Storie, R. E., 333, 635, 777.
 Stoughton, R. H., 43, 372, 814.
 Stout, A. B., 504, 523, 524.
 Stoutemyer, V. T., 48.
 Stoykovitch, V. N., 602.
 Strand, A. L., 232.
 Strandoskov, H. H., 353.
 Strange, C. R., 865.
 Stratman-Thomas, W. K., 392.
 Strauch, T. J., 708.
 Street, O. E., 518, 519.
 Strickland, E. H., 548, 549.
 Strilciuc, D., 363.
 Stringfield, G. H., 38, 794.
 Strong, W. W., 323.
 Stroud, E., 124.
 Strubinger, L. H., 48.
 Stuart, H. O., 435, 863.
 Stuart, W. W., 61.
 Stubbs, E. L., 113.
 Stubbs, W. C., 161, 911.
 Stuckey, H. P., 159, 317.
 Stuckey, W. R., 527.
 Stugart, R., 493.
 Stumberg, J. E., 267.
 Sturges, A., 697.
 Stylianopoulos, M., 592.
 Su, M. T., 373.
 Subrahmanyam, V., 380.
 Subramaniam, T. V., 234.
 Sullivan, A. J., 303, 750.
 Sullivan, J., 90.
 Sullivan, V. R., 330.
 Sullivan, W. N., 234, 242.
 Summers, E. M., 535.
 Summers, J. N., 71.
 Sundling, H. L., 370.
 Supplee, G. C., 154, 418.
 Sure, B., 617, 618, 758, 760, 761, 897.
 Sushkinoi (Sushkina), N. N., 183.
 Sutch, W. B., 298.
 Sutcliffe, H., 189.
 Sutcliffe, R. C., 178.
 Sutherland, J. R. G., 547.
 Sutton, T. S., 99.
 Suzuki, H., 66.
 Svensson, S., 592.
 Swales, W. E., 437, 683.
 Swallow, G. C., 623.
 Swanback, T. R., 518, 649.
 Swanson, C. O., 281, 460, 597.
 Swanson, P., 48.
 Swanson, P. P., 148.
 Swardt, S. J. de, 450.
 Swartz, VeN. W., 907.
 Sweany, H. C., 271, 711.
 Sweet, A. T., 334, 777.
 Sweetman, H. L., 231, 397, 783.
 Sweetman, M. D., 462.
 Swellengrebel, N. H., 81, 558.
 Swenson, T. L., 256, 704.
 Swezey, O. H., 385.
 Swift, R. W., 698.
 Swingle, W. T., 56.
 Sykes, J. F., 312.
 Sylvanus, E. B., 748.
 Sylwester, E. P., 674.
 Symes, C. B., 81.
 Sysak, N., 579.
 Szent-Györgyi, A., 7, 11.
 Szulc, G., 901.

- Tabern, D. L., 148.
 Taggart, W. G., 405.
 Tague, E. L., 906.
 Takahashi, M., 643.
 Takahashi, W. N., 673.
 Takato, R., 694.
 Taka-Tsukasa (Prince), 230.
 Talarewitch, E., 591.
 Talavera, F., 303.
 Talbert, A., 756.
 Talbert, T. J., 552.
 Taliaferro, W. H., 577.
 Tallent, V. K., 847.
 Tamm, E., 775.
 Tanaka, S., 68.
 Tange, U., 751.
 Tanikawa, T., 421.
 Tanner, F. W., 577, 746.
 Tanquary, M. C., 246.
 Tänzer, E., 572.
 Tascher, W. R., 665.
 Tate, H. D., 233, 828.
 Tate, P., 243.
 Tatum, E. L., 771.
 Taubenhaus, J. J., 528, 536, 541.
 Tavernetti, J. R., 51.
 Tayloe, W. L., 552.
 Taylor, A. E., 138.
 Taylor, E. L., 544.
 Taylor, F. W., 768.
 Taylor, H. C., 449, 624.
 Taylor, H. S., 323.
 Taylor, J. W., 666.
 Taylor, L. W., 195, 255.
 Taylor, M. W., 703.
 Taylor, N. B., 312, 764.
 Taylor, R. M., 582.
 Taylor, T. H., 534.
 Taylor, T. J., 595.
 Taylor, W., 580.
 Teele, R. P., 769.
 Teik, G. L., 75.
 Templeton, H. L., 848.
 Templeton, J., 188, 204.—
 Templin, V., 890.
 Tepper, A. E., 406, 569.
 Terbrüggen, F., 270.
 Terzaghi, K. von, 323.
 Teske, A. H., 386.
 Tester, K. B., 206.
 Thaden, J. F., 744.
 Tharp, W. E., 334.
 Tharp, W. H., 356, 810.
 Thatcher, L. E., 38, 45, 90, 406.
 Thayer, S. A., 484.
 Theiler, A., 272.
 Thévenoz, L., 715.
 Thibodeaux, B. H., 645.
 Thiel, A. F., 504.
 Thies, W. H., 384, 652.
 Thigpen, J. E., 737.
 Thille, M., 891.
 Thimann, K. V., 632.
 Thom, C., 189.
 Thoma, K. M., 889.
 Thomas, B. H., 89, 405, 406.
 Thomas, C. A., 80, 396.
 Thomas, E., 737.
 Thomas, E. F., 265, 720.
 Thomas, F. L., 836.
 Thomas, I., 695.
 Thomas, K. M., 818.
 Thomas, L. J., 110.
 Thomas, M., 539.
 Thomas, M. D., 644.
 Thomas, R., 517.
 Thomas, R. C., 61.
 Thomas, R. M., 869.
 Thomas, W. K. S., 392.
 Thomas, W. L., 553.
 Thomoff, Z., 580.
 Thompson, B. H., 681.
 Thompson, C. P., 405.
 Thompson, E. K., 448.
 Thompson, L., 585.
 Thompson, R. L., 886.
 Thompson, R. W., 548.
 Thompson, W. C., 411.
 Thompson, W. L., 231.
 Thompson, W. R., 384.
 Thompson, W. S., 458.
 Thomsen, L. C., 848.
 Thomson, D. L., 350.
 Thomson, J. R., 232, 685.
 Thomson, W. S., 390.
 Thor, C. J. B., 483.
 Thorne, G. B., 697.
 Thornthwaite, C. W., 634.
 Thornton, N. C., 50.
 Thornton, S. F., 780.
 Thorp, F., Jr., 280, 426, 585.
 Thorp, J., 516.
 Thorp, J. T., 179.
 Thrun, F. M., 302.
 Thung, T. H., 62.
 Thurber, G. A., 238.
 Thursby, I. S., 891.
 Thurston, H. W., Jr., 811.
 Thurston, L. M., 261, 706.
 Tilford, P. E., 61, 220.
 Tiller, L. W., 675.
 Tillmans, J., 7, 8, 9.
 Tillyard, R. J., 557.
 Timofceff, P. P., 710.
 Timonin, M., 184.
 Tims, E. C., 535.
 Tincker, M. A. H., 652.
 Tingey, D. C., 30, 651.
 Tinkler, C. K., 747.
 Tisdale, W. B., 221.
 Tisdall, F. F., 313, 464.
 Tissot, A. N., 231, 239.
 Titherington, R. J., 901.
 Titus, H. W., 96, 403, 846.
 I'panov, N. M., 58.
 Tobiska, J. W., 839.
 Todd, C., 272.
 Toenjes, W., 212.
 Togashi, K., 65, 69.
 Toit, F. J. du, 450.
 Toit, F. M. du, 450.
 Toit, P. J. du, 107, 420.
 Tolaas, A. G., 795.
 Tolley, H. R., 299, 478, 600.
 Tom, R. C., 767.
 Tomhave, A. E., 89, 98, 405, 846.
 Tomkins, R. G., 538.
 Tomonaga, N., 421.
 Tonkes, P. R., 389.
 Toole, L. E., 756.
 Topper, A., 750.
 Torgut, M., 579.
 Torrance, J. B., 123.
 Torrey, J. C., 473.
 Torrey, J. P., 114, 280.
 Totzeck, E., 579.
 Tough, E. G., 745.
 Toverud, G., 755.
 Toverud, K. U., 755.
 Townsend, G. R., 61.
 Townsend, J. F., 546.
 Tracy, P. H., 265, 417, 850, 854.
 Tracy, R. L., Jr., 6.
 Traub, H. P., 57.
 Trautwein, K., 578, 710.
 Travassos, L., 545.
 Trawiński, A., 580.
 Trebler, H. A., 734.
 Trebra, R. L. von, 201.
 Treichler, R., 418.
 Trelease, W., 162.
 Tressler, D. K., 615, 768.
 Triebold, H. O., 167, 417.
 Trivett, J., 516.
 Trout, G. M., 573.
 Trowbridge, E. A., 699.
 True, A., 443.
 Trump, I. J., 29.
 Truog, E., 776.
 Truran, W. E., 663, 687.
 Tsai, P. H., 234.
 Tsedeler, O. E., 80.
 Tsekulina, A., 287.
 Tsukasa, T., (Prince), 230.
 Tucker, C. M., 528.
 Tucker, L. R., 214.
 Tucker, R. W. E., 548.
 Tuckey, S. L., 265.
 Tukey, H. B., 214.
 Tullis, E. C., 671, 818.
 Tülpanoff, N. M., 58.
 Tunison, A. V., 90.
 Tunncliffe, E. A., 859.
 Turandin, 578.
 Turk, K. L., 90, 99, 849.
 Turk, L. M., 23.
 Turneure, F. E., 283.
 Turner, C. W., 349.
 Turner, D., 890.
 Turner, N., 84, 546.
 Turner, P. E., 515, 516, 517.
 Turner, R. G., 467.
 Turner, W. D., 323.
 Tutt, J. F. D., 585.
 Twele, H., 341.
 Twilight, E. H., 524.

Twinn, C. R., 281, 547.
Tyagny-Ryadno, M., 779.
Tyler, J., 542.
Tysdal, H. M., 354.
Tzortzaki, N., 590.

Überreiter, O., 578.
Uchida, T., 246.
Udall, D. H., 428.
Uhland, R. E., 721.
Uichanco, L. B., 825, 826.
Úlehla, V., 188.
Umeno, S., 424.
Umezu, M., 421.
Underhill, F. A., 753, 754, 763.
Underhill, G. W., 689.
Underwood, C., 43.
Underwood, E. J., 404.
Underwood, F. L., 127.
Underwood, P. C., 106, 267, 268.
Urizar, R., 273.
Urquhart, L. C., 120.
Uwaroff, W., 578.

Vadimov, V., 703.
Vahlteich, E. McC., 749.
Vail, C. E., 839.
Valgren, V. N., 289, 738.
Valle, C. C., 203.
Valle, M. A. del, 517.
Valleau, W. D., 675.
van de Laar, J. H. J., 374.
Vandendries, R., 372.
van der Elst, P., 225.
van der Hoeden, J., 111, 591.
van der Horst, E. C. von P., 517.
van der Lek, H. A. A., 188.
van der Merwe, C. P., 556.
van der Rijst, M. P. J., 151.
van der Veen, R., 220.
Van Donk, E. C., 839.
van Eekelen, M., 324.
Van Es, L., 275.
Van Eseltine, G. P., 367.
Van Haltern, F., 668.
van Heelsbergen, T., 434.
van Heurn, W. C., 553.
Van Horn, A. G., 413.
Vanin, S. I., 678, 680, 681.
Van Meter, R. A., 384, 652.
Van Roekel, H., 709.
Vansell, G. H., 87, 555.
Van Slyke, D. D., 171, 172.
Van Slyke, L. L., 419.
Van Steenburgh, W. E., 548.
van Veen, A. G., 325, 326.
Van Volkenberg, H. L., 105.
Van Wagenen, A., 90.
van Wagenen, G., 36.
van Wijk, A., 151.
Van Zwaluwenburg, R. H., 535.
Vargha, L., 773.

Varley, G. C., 545.
Vass, A. F., 444.
Vaughan, H. F., 708.
Vaughan, L. M., 443.
Vawter, L. R., 277, 713.
Veatch, J. O., 495, 522, 778.
Veen, A. G. van, 325, 326.
Veen, R. van der, 220.
Veenendaal, H., 579.
Veihmeyer, F. J., 659.
Veitch, R., 555.
Venard, C., 268.
Venkatraman, S. N., 358.
Venkatraman, T. S., 517.
Venstrom, C., 612.
Ventre, E. K., 517.
Verner, L., 214.
Verplancke, G., 816.
Verwoerd, L., 526, 540.
Verzár, F., 904.
Vestal, C. M., 405.
Vestal, E. F., 60.
Vial, E. E., 504, 705.
Vickers, G. S., 847.
Vickery, H. B., 144, 165, 771.
Victor, Sister M., 763.
Vigneaud, V. du, 146.
Vigneaud, Z. du, 146.
Viljoen, P. R., 450.
Villanueva, E., 748.
Vinall, H. N., 644.
Vincent, M., 243.
Vinke, L., 319, 842.
Violette, N. L., 685.
Viridén, P., 590.
Virtanen, A. I., 781.
Virtue, G. O., 136.
Vivoli, G., 160.
Vladimirskaiâ (Vladimirsky), N. N., 680.
Voelker, R. A., 160.
Vogel, M. A., 72, 78.
Vogel, O. A., 599.
Vogelsang, E., 545.
Vogl, K., 878.
Vöhringer, K., 242.
Volk, N. J., 776.
Volkmar, F., 579.
Volz, E. C., 48.
Voorhees, R. K., 221, 669.
Voris, L., 413, 698.
Voukassovitch, P., 246.

Wachter, H. M., 38.
Wad, Y. D., 788.
Wade, E. M., 271.
Wadham, S. M., 290.
Wadleigh, H. J., 610.
Wadsack, H. A., 443.
Wadsworth, H. A., 635.
Wadsworth, R. V., 390.
Wagner, F. A., 201.
Wahby, A. M., 425.
Waide, J. B., Jr., 405.
Wait, B., 892.

Waite, M. B., 652.
Waite, R. H., 411.
Waite, W. C., 600.
Wakeley, P. C., 58.
Walden, B. H., 546.
Waldo, G. F., 56, 659.
Waldron, L. R., 355.
Walker, D. J., 758, 760.
Walker, F. W., 231, 239, 910.
Walker, G. P., 547.
Walker, G. T., 13.
Walker, H. G., 77, 678.
Walker, J. C., 531, 533, 810, 813.
Walker, L. S., 841.
Walker, M. N., 221.
Walker, R., 618.
Walker, R. H., 515.
Walker, W. P., 440.
Wall, N. J., 443.
Wall, R. E., 623.
Wallace, B. A., 456.
Wallace, G. I., 110.
Wallace, Q. W., 565.
Wallace, R. H., 507.
Wallace, T., 799.
Waller, D. S., 751, 894.
Walley, E., 443.
Wallin, Z. B., 288.
Walsh, F. E., 713.
Walters, W. G. D., 644.
Walther, E., 560, 836.
Walton, A., 268.
Walton, C. L., 552, 558.
Walworth, G., 737.
Wanser, H. M., 790.
Ward, G. H., 442.
Ward, K. M., 689.
Ward, R. R., 174.
Wardlaw, C. W., 538, 676, 806.
Wardlaw, H. S. H., 306.
Wardle, R. A., 425.
Ware, W. M., 222, 227, 375, 815, 821.
Wariar, U. A., 29.
Warrington, K., 650.
Warneford, F. H. S., 225.
Warner, J. D., 199.
Warner, M. F., 823.
Warren D. C., 31, 195.
Warren, D. M., 273.
Warren, G. F., 127, 295, 296.
Warth, F. J., 699.
Washburn, F. L., 847.
Washburn, R. G., 99, 102.
Washburn, R. M., 709.
Washburn, R. S., 293.
Watanabe, R., 522.
Waterhouse, A., 468.
Waterhouse, G. A., 388.
Waterman, A. M., 679.
Waters, N. F., 89, 104.
Watkin, J. E., 637.
Watkins, W. G., 87.
Wats, R. C., 310.
Watson, I., 767.

- Watson, J. R., 231.
 Watson, S. J., 249, 250, 251, 252, 320.
 Watson, T. Y., 840.
 Watson, W. A., 335.
 Watt, W. E., 450.
 Watts, J. W., 350.
 Watts, V. M., 781.
 Waugh, F. A., 319.
 Waugh, W. A., 10, 774.
 Wayne, R., 850.
 Weakley, C. E., Jr., 406.
 Weaver, D. S., 437, 442.
 Weaver, F. P., 601.
 Weaver, M. C., 289.
 Weaver, W. E., 99, 116.
 Webb, B. H., 260, 261.
 Webb, R. B., 208.
 Weber, A. D., 91, 248, 407.
 Weber, A. L., 210, 436, 684.
 Weber, G. F., 221, 223.
 Weber, H., 545.
 Webre, A. L., 517.
 Webster, J. E., 492.
 Webster, L. T., 510.
 Wedemann, W., 578.
 Wedemeyer, J., 397.
 Wedgworth, H. H., 221.
 Weed, L. A., 870.
 Weeks, J. R., 177.
 Weetman, L. M., 48.
 Weevers, T., 188.
 Wehr, E. E., 268.
 Wehrwein, G. S., 442, 737, 881.
 Weiben, M., 630.
 Weigel, C. A., 387, 688.
 Weimarn, P. P. von, 323, 324.
 Weinberger, J. H., 656.
 Weinstein, L., 5.
 Weinstock, M., 155.
 Weisner, E. S., 158.
 Weiss, F., 61.
 Weiss, F. E., 43.
 Welch, D. S., 61.
 Welch, H., 584.
 Weld, C. B., 312, 764.
 Weldon, G. P., 55.
 Weller, D. M., 206.
 Wellington, R., 212, 805.
 Wellman, H. R., 294.
 Wells, E. L., 332, 333.
 Wells, O. V., 739.
 Welton, F. A., 38.
 Went, F. A. F. C., 188.
 Wentworth, E. N., 405.
 Wentz, J. B., 37.
 Wentzel, W., 285.
 Werkman, C. H., 3, 324, 327.
 Werner, H. O., 521.
 Wertz, V. R., 880.
 West, A. P., 393.
 West, C., 803.
 West, D. C., 55.
 West, E., 221.
 West, E. S., 339.
 West, J., 527.
 Westall, R. G., 492.
 Westenbrink, H. G. K., 308.
 Wester, R. E., 814.
 Westerdijk, J., 372.
 Westgate, J. M., 766.
 Westgate, M., 633, 683.
 Westhues, M., 580, 710.
 Westly, E. D., 517.
 Weston, M., 475.
 Westover, H. L., 354, 644.
 Westover, K. C., 648.
 Westveld, R. H., 59, 525.
 Wetmore, A., 682.
 Wetzell, N. C., 464.
 Whang, P. C., 463.
 Wheeler, E. J., 648.
 Wheeler, H. J., 319.
 Wheeler, S. S., 406.
 Whelpton, P. K., 443, 458.
 Whetten, N. L., 767.
 Whetzel, H. H., 61.
 Whipple, D. V., 154.
 Whitaker, T. W., 638.
 Whitcomb, W. D., 245, 384, 387, 686.
 Whitcomb, W. O., 46.
 White, C. H., 437.
 White, G. F., 267.
 White, H. E., 652.
 White, H. L., 488.
 White, M. J. D., 195.
 White, R. P., 687, 807.
 White, W., 705.
 White, W. H., 652.
 White, W. I., 310.
 White, W. J., 793.
 White, W. T., 88.
 Whitehead, T., 644.
 Whitehead, W. E., 73.
 Whiting, L. D., 460.
 Whitlam, A. G., 290.
 Whitlock, M. C., 765.
 Whitman, L., 595.
 Whitnah, C. H., 257.
 Whitnall, A. B. M., 420.
 Whitney, W. A., 812.
 Whitsitt, M. L., 160.
 Wickens, D. L., 442, 443, 444, 445.
 Wicks, W. H., 546.
 Wiecking, E. H., 443.
 Wiegand, E. H., 523.
 Wiese, H. F., 263, 853.
 Wiesehuegel, E. G., 57.
 Wiesner, B. P., 33, 197.
 Wiggans, R. G., 202.
 Wigglesworth, V. B., 393.
 Wight, A. E., 275.
 Wight, H. M., 544.
 Wile, D. A., 910.
 Wijk, A. van, 151.
 Wilber, C. P., 451.
 Wilbrink, G., 535.
 Wilbur, D. A., 232.
 Wilbur, J. W., 849.
 Wilcke, H. L., 104, 719.
 Wilcox, D. E., 703.
 Wilcox, J., 396.
 Wilcox, R. B., 378.
 Wilcox, R. H., 881.
 Wilcox, W. W., 888.
 Wilcoxon, F., 235, 236.
 Wilder, O. H. M., 90.
 Wilder, W., 147, 152, 194, 839.
 Wildermuth, R., 777.
 Wildermuth, V. L., 830.
 Wildman, J. D., 233.
 Wildon, C. E., 216, 217.
 Wildt, J. C. de R. de, 755.
 Wileman, R. H., 732.
 Wilhelm, H. A., 620.
 Wilken-Jorden, T. J., 421.
 Wilkins, A. H., 660.
 Wilkins, F. S., 37.
 Wilkinson, D. S., 398.
 Willard, C. J., 38.
 Willard, H. H., 489.
 Willard, H. S., 412.
 Willard, J. D., 302.
 Willey, H. F., 643.
 Williams, C. B., 56, 187, 205, 341.
 Williams, C. G., 158.
 Williams, F. X., 385.
 Williams, K. T., 117.
 Williams, L. L., 71.
 Williams, R. R., 148.
 Williams, W. K., 372.
 Williamson, L. J., 891.
 Williamson, R. M., 776.
 Willimeczik, M., 578.
 Willman, J. P., 90, 405.
 Wilsdon, A. J., 105.
 Wilsie, C. P., 643.
 Wilson, A. L., 366.
 Wilson, B. D., 337.
 Wilson, D. R., 110.
 Wilson, H. K., 201.
 Wilson, I. D., 586.
 Wilson, J. D., 61, 220, 374.
 Wilson, J. F., 406.
 Wilson, J. J., 60.
 Wilson, J. L., 75.
 Wilson, J. W., 231, 392, 398.
 Wilson, L. B., 649.
 Wilson, L. T., 709.
 Wilson, M. L., 319, 443, 444, 603.
 Wilson, P. W., 183.
 Wilson, R., 290.
 Wilson, W. H., 302.
 Wilson, W. K., 509, 572.
 Winant, H. B., 15, 334.
 Winburn, T. F., 242.
 Windaus, A., 151.
 Wingfield, J. C., 36, 47.
 Winn, A. F., 557.
 Winn, W. A., 720.
 Winter, A. R., 845.
 Winter, C. E., 451.
 Winter, H. F., 61.
 Winter, O. B., 489.

- Winterhalter, W., 549.
 Winters, R. K., 218.
 Wirth, D., 579.
 Wislicenus, H., 323.
 Wisnicky, W., 275.
 Witherspoon, J. T., 353.
 Withrow, L., 121.
 Withrow, R. B., 49.
 Witte, J., 579.
 Witter, J. F., 856.
 Wittholz, W., 579.
 Wokken, H., 573.
 Wolfe, H. R., 422.
 Wolfe, J. M., 197.
 Wolman, A., 330.
 Wolters, K. L., 580.
 Wolters, W., 206.
 Womersley, H., 237, 552.
 Wood, E. L., 480.
 Wood, G. L., 290.
 Wood, J. I., 663.
 Wood, M. N., 807.
 Wood, W. A., 105.
 Wood, W. R., 159.
 Woodhouse, L. H., 443.
 Woodman, H. E., 400, 401,
 402, 403, 404, 566, 567,
 698.
 Woodruff, S., 747.
 Woods, E., 412.
 Woods, J. B., 818, 874.
 Woods, W. W., 406.
 Woodward, G. E., 172.
 Woodward, J. C., 90.
 Woodward, T. E., 30, 705.
 Woodworth, C. M., 192.
 Woodworth, H. C., 139, 445.
 Woofter, T. J., Jr., 141.
 Wooton, E. O., 601.
 Work, S. H., 99, 849.
 Working, E. B., 460.
 Working, E. J., 650.
 Working, H., 453.
 Wormald, H., 376.
 Worrall, R. L., 32.
 Worthley, H. N., 389, 440.
 Worthley, L. H., 78, 245.
 Wright, G. M., 681.
 Wright, J. W., 339, 514.
 Wright, K. T., 97, 600.
 Wright, S., 507, 638.
 Wright, T., 405.
 Wright, T. S., 567.
 Wright, W., 131, 603.
 Wright, W. H., 106, 267.
 Wrigley, P. I., 440.
 Wurtz, G. B., 176.
 Wyant, Z. N., 22.
 Wyman, A. F., 883.
 Wynne, A. M., 166.
 Yakimoff, W. L., 545, 580,
 594, 711, 718.
 Yale, M. W., 416, 708.
 Yamagiwa, S., 421.
 Yamamoto, R., 151.
 Yamamoto, W., 824.
 Yamauti, K., 680.
 Yapp, W. W., 348.
 Yarwood, C., 223, 375.
 Yates, F., 36, 814.
 Yeager, A. F., 369.
 Yeomans, M. S., 385.
 Yetter, W. P., Jr., 831.
 Ylizarde, H. L., 748.
 Yoder, F. R., 302.
 York, H. H., 85.
 Yoshie, S., 181.
 Yothers, W. W., 73.
 Young, A. W., 498.
 Young, D. W., 497.
 Young, E. C., 881.
 Young, G. E., 885.
 Young, H. C., 61.
 Young, J. B., 18.
 Young, M., 474.
 Young, R. E., 652.
 Young, R. L., 623.
 Young, S. P., 381.
 Young, V. A., 58.
 Young, W. J., 538.
 Youngs, F. O., 777.
 Youngstrom, C. O., 131.
 Yount, H. W., 289.
 Yust, H. R., 388.
 Zakarias, L., 324.
 Zaleski, K., 61, 812.
 Zamfirescu, N., 25.
 Zappa, M. P., 546.
 Zasukhin, D. N., 248.
 Zaumeyer, W. J., 387.
 Zavadskaia, N. D., 510, 788.
 Zdansky, E., 595.
 Zehner, M. G., 666.
 Zeilor, V., 592.
 Zeissig, A., 273, 428.
 Zeissler, J., 579.
 Zeleny, L., 318.
 Zepp, H. D., 582.
 Zerban, F. W., 518.
 Ziegler, N. R., 6.
 Ziemba, J., 160.
 Zieve, I., 32.
 Zilva, S. S., 9, 10, 307, 327,
 904.
 Zimmerman, C. C., 299, 612.
 Zimmerman, H. M., 311.
 Zink, F. J., 120, 281, 440.
 Zoheiry, M. S. El, 688.
 Zon, R., 443.
 Zook, L. L., 789.
 Zucker, F., 323.
 Zucker, T. F., 154, 474.
 Zúñiga H., J. L., 588.
 Zunker, M., 580.
 Zwaluwenburg, R. H. Van,
 535.
 Zwetkoff, K., 578.
 Zwölfer, W., 233, 234.

INDEX OF SUBJECTS

NOTE.—The abbreviations "Ala.", "Conn.State", "Mass.", etc., after entries refer to the publications of the respective State experiment stations; "Alaska", "Hawaii", "P.R.", and "V.I.", to those of the experiment stations in Alaska, Hawaii, Puerto Rico, and Virgin Islands; "Can." to those of the experiment stations in Canada; and "U.S.D.A." to those of this Department.

- Abia americana* on *Lonicera*, 73.
- Abortion—see also *Bacillus abortus*, *Bacterium abortus*, and *Brucella abortus*.
- agglutination tests, principles and practices, 107.
- control, value of lye solution as disinfectant, 107.
- diagnosis, agglutination test, factors affecting, Minn. 318.
- diagnosis, drawing and handling blood samples for, Conn.Storrs 107.
- epizootic, and undulant fever, 266.
- eradication, Idaho 865; N.H. 420.
- in cattle, agglutination tests for, Ind. 104.
- in cattle, agglutination titer, effect of trypan blue, thionine, and pyronine, 108.
- in cattle and swine, Calif. 104.
- in cattle, diagnosis, 856.
- in cattle, immunization, 585.
- in cattle in Netherlands, 426.
- in cattle, need for further research, 273, 713.
- in cattle, portals of entry, 426.
- in cattle, relation to trichomonads, 712, 713.
- in herd of cattle, breeding results, 348.
- in herd of dairy cattle, Nebr. 578.
- in hogs and mares, Ind. 104.
- in mares, filtrable virus of, Ky. 433.
- in pigs, Ind. 104.
- in sheep and goats in Cyprus, 109.
- in sheep, spirilla as cause, 717.
- papers on, 273.
- rapid spread in an accredited herd, 426.
- studies, Kans. 265; Wis. 865.
- summary, 713.
- vaccination of pregnant cows with living bacilli, effect, 428.
- Acanthopsyche junodi*, insecticidal dusts for tests, 78.
- Acanthoscelides obtectus*, see Bean weevil.
- Acarophenax tribolii*, notes, 396.
- Accessory food factors, see Vitamins.
- Accounting, farm, see Farm accounting.
- Acetic acid as soil disinfectant, Mass. 663.
- Acetone—
- biological production, factors in, 5.
- production from molasses, P.R. 771.
- Achatodes zeae*, biology and morphology, U.S.D.A. 389.
- Acid phosphate, see Superphosphates.
- Acidosis, dairy feeds causing, Ohio 99.
- Acids—
- amino, see Amino acids.
- fatty, see Fatty acids.
- organic, and carbohydrates in succulent plants, interrelations, 187.
- organic, in green plants, physiology, 187.
- Acne vulgaris*, vitamin D treatment, 762.
- Acrobasis*—
- caccinii*, notes, Fla. 231.
- caryae*, see Pecan nut case bearer.
- Acrosternum hilaris*, see Stink bug, green.
- Actinobacillosis*—
- of cattle in United States, 585.
- use of term, 714.
- Actinomyces bovis*, preservation in ray fungus form, 269.
- Actinomycosis*, studies, 269.
- Actinomycosis*, use of term, 713.
- Addisin from swine for treatment of pernicious anemia, 314.
- Adhesion and cohesion, 323.
- Adisura atkinsoni*, parasite of, mass rearing, 234.
- Adjustment program in southeast Missouri, critical elements, Mo. 601.
- Adrenals—
- disappearance of vitamin C from, during scurvy, 619.
- hypertrophy in scurvy, 620.
- vitamin C in, 903.
- Adsorption by silica gel, theory and applications, 323.
- Aegeria exitiosa*, see Peach borer.
- Aeginetia indica*, notes, 534.
- Aegyptianella pullorum* of fowls—
- in Greece, 595.
- in South Africa, 114, 420.
- Agathis bischoffi* parasite of moth enemy of lac insect, 233.
- Ageniaspis fuscicollis*, notes, 247.
- Agrarian reform—
- and land problems in different countries, 601.
- prior to World War, 602.
- Agria mamillata*, notes, 247.

Agricultural—

- accounts, farmer's interpretation, 444.
- College proposed at Tsinghua University, China, 768.
- colleges—*see also* Iowa, Kansas, Massachusetts, *etc.*
 - organization list, U.S.D.A. 142.
- colonization, *see* Land settlement.
- conditions on the Huntley reclamation project, U.S.D.A. 881.
- cooperation, 610.
- cooperation in Scotland and Wales, 298.
- credit—
 - in South, 444.
 - in United States, history and theory, treatise, 288.
 - long-time, methods of, Kans. 288.
 - short-time and emergency, developments, 443.
 - short-time and mortgage, of New York farmers, N.Y.Cornell 127.
- credits, Federal intermediate, 604.
- crisis, 290.
- crisis in Czechoslovakia, 600.
- crisis in 1930–31, 602.
- depression in 1931–32, 602.
- distribution, burden of increased costs, 456.
- Economics Research Institute, report, 445.
- education—*see also* Agricultural colleges and Agricultural schools.
 - and research in Nanking University, 624.
 - vocational, effectiveness, 459.
- emergency in Iowa, Iowa 131, 603.
- engineering, *see* Engineering.
- experiment stations, *see* Experiment stations.
- export trade, 450.
- extension, *see* Extension.
- financing, 444.
- indebtedness in foreign countries, relief measures, U.S.D.A. 446.
- indebtedness, State measures for relief, U.S.D.A. 604.
- insurance in Canada, 610.
- insurance research, scope and method, 289.
- journals, new, 160, 319, 624.
- labor in Finland, scientific organization, 602.
- labor income on farms with mechanical power, Ind. 126.
- labor incomes, decline, 1930 to 1932, N.H. 445.
- labor turnover, relation to housing conditions, Md. 613.
- legislation, international yearbook, 448.
- machinery—*see also* Combines, Threshing, *etc.*
 - and power, U.S.D.A. 727.
 - for corn borer control, Pa. 440.
 - notes, Calif. 116.
 - relation to insect pest control, 826.

Agricultural—Continued.

- machines for testing rice for breakage in milling, 286.
 - Marketing Act, British, 610.
 - marketing, compulsory proration in, economic and legal aspects, Calif. 741.
 - marketing course, content, 443.
 - marketing, research in, 296.
 - outlook for Illinois, 1933, Ill. 132.
 - outlook for 1933, U.S.D.A. 131.
 - policy, American, treatise, 600.
 - price-supporting measures in Latin America, 741.
 - production—
 - and land utilization, 444.
 - changes from 1925 to 1929, Ohio 127.
 - costs in Oklahoma, Okla. 292.
 - current, credit problem, 444.
 - diminishing returns in, 450.
 - physical volume, N.Y.Cornell 127.
 - products—
 - after decade of expansion, U.S.D.A. 651.
 - comparative prices, Ohio 880.
 - Florida, grading and packing, Fla. 209.
 - futures trading and legislation, 610.
 - marketing, *see* Marketing.
 - perishable, improvement in handling, transporting, and storing, U.S.D.A. 652.
 - perishable, wholesale distribution methods, Mass. 737.
 - prices, 443; Ohio 128.
 - prices and price trends, Me. 444.
 - prices in Wisconsin, Wis. 881.
 - prices, measuring the effect of supplies, 443.
 - regions of North America, 290, 737.
 - relief, domestic allotment plans for, U.S.D.A. 133.
 - research in England, 288.
 - research in United Kingdom, reports, 318.
 - schools, evening, organization and teaching procedure, 141.
 - schools, part-time, 746.
 - situation and foreign trade of United States, Okla. 288.
 - situation in the State, Okla. 737.
 - statistics, U.S.D.A. 744.
 - statistics based on data for farm accountancy, 611.
 - statistics, international yearbook, 458.
 - systems of middle Europe, treatise, 602.
- Agriculture—
- adjustment to industrial rationalization, 444.
 - American, planned production in, treatise, 450.
 - American, recent economic changes, Mo. 601.

Agriculture—Continued.

- and world crisis, U.S.D.A. 736.
- British and Irish writers on, 318.
- collective bargaining in, 602.
- Department of, *see* United States Department of Agriculture.
- economic planning in, 444.
- electricity in, *see* Electricity.
- in Oklahoma, immediate social problems, Okla. 288.
- in Sumter County, S.C. 291.
- of an area, method of study, Idaho 293.
- of British Empire, treatise, 449.
- of Connecticut Valley, Conn. Storrs 607.
- of Kona district of Hawaii, effect of physical features, Hawaii 778.
- of world, treatise, 290.
- yearbook, U.S.D.A. 766.
- Agriolimax agrestis*, intermediate host of fowl tapeworm, 544.
- Agriotes*—*see also* Wireworms.
- spp., biology, 233.
- Agromyza pusilla*, *see* Leaf miner, serpentine.
- Agropyron* spp., relation to wheat foot rot in Alberta, 530.
- Agrotis ypsilon*, *see* Cutworm, black.
- Agrypon anxium*, notes, 246.
- Aiolocaria mirabilis*, biology, 560.
- Air, fresh, effect on resistance to infection, 313.
- Akala, culture experiments, Hawaii 652.
- Alabama Station, fiftieth anniversary, editorial, 161.
- Alanine, cupric complexes, 632.
- Alaska Stations, report, 157.
- Albugo candida*, biologic forms on crucifers, 61.
- Albumin, egg—
- cause of pellagra-like disease in rats, Wis. 890.
- watery during storage, Calif. 88.
- Alcohol—*see also* Butyl alcohol.
- and gasoline, blending for motor fuel, Idaho 871.
- and gasoline fuel blends, performance tests, 729.
- as motor fuel, U.S.D.A. 730.
- benzyl, small quantities, determination, 490.
- denatured, freezing and flow points for, 122.
- effect on germ cells of male rabbits, N.Y. Cornell 35.

Alfalfa—

- analyses, Alaska 36.
- and grass mixtures v. pure stands, Ohio 38.
- as forage for hogs, S.C. 254.
- as pasture for dairy cows, Mich. 572.
- as vitamin supplement and effect on yolk color, Idaho 839.
- autogamous, 793.
- bacterial wilt, notes, 668; Idaho 810; Kans. 222.

Alfalfa—Continued.

- bacterial wilt, varietal susceptibility, 530; Nebr. 531.
- breeding, Kans. 200; Nebr. 512; R.I. 200.
- burning, value, Calif. 37.
- clover, and timothy mixture on meadows, tests, Ohio 38.
- composition and yield, effect of cutting stage, 562.
- culture experiments, Idaho 789; Kans. 200; Oreg. 354.
- cutting tests, Calif. 37; Ind. 37.
- diseases, control methods, 222.
- effect of fall pasturing or cutting, Wis. 791.
- exposed to sunshine in curing process, vitamin A in, 251.
- exposed to sunshine in curing process, vitamin D in, 252.
- failures, studies, Nebr. 526.
- fertilizer and liming tests, Wis. 791.
- fertilizer experiments, Del. 37; Kans. 200; N.H. 353, N.Mex. 200; Oreg. 354.
- for hogs, U.S.D.A., 839.
- growth and inoculation, effect of soil treatments, Kans. 179.
- hardening process in, factors affecting, 354.
- hardiness in, N.H. 638.
- hardiness in, relation to hydrophilic colloids, 365.
- hay, changes in vitamin content, Colo. 839.
- hay, chopping, Idaho 871.
- hay cut at different stages, vitamin A in, Ind. 98.
- hay cut at different stages, vitamins in, Ohio 90.
- hay, effect on growth of Holstein heifers, 412.
- hay for fattening pigs, Idaho 838.
- hay, nutrients in, effect of artificial drying, Wis. 848.
- hay, quality, effect of harvesting and baling, Kans. 281.
- hay, second-cutting, relation to fertilizers, Kans. 179.
- hay v. soybean silage for milk production, Fla. 257.
- hay v. soybeans for milk and butterfat production, Kans. 257.
- hay v. tepary bean hay for heifers, Okla. Panhandle 573.
- in rotations, value, U.S.D.A. 789.
- irrigation for, Tex. 39.
- irrigation requirements, Kans. 200.
- Ladak, for range improvement, N.Mex. 200.
- leaves and stems for lambs, calcium and phosphorus balances, 406.
- losses from bacterial wilt, U.S.D.A. 644.
- meal as source of vitamin A, N.H. 406.

Alfalfa—Continued.

- on bacterial wilt infected soil, tests. Iowa 37.
- pasture for fattening cattle, Nebr. 562.
- pasture for swine, Kans. 248.
- plant, characters concerned with seed production, 355.
- production, factors affecting, Wyo. 791.
- proteins, nutritive value, N.Y.Cornell 90.
- seed production studies, Oreg. 354.
- seed screenings v. linseed meal for dairy cows, Idaho 848.
- silage, *see* Silage.
- thrips, notes, Kans. 232.
- varieties, cold resistance in, Kans. 200.
- varieties, comparison, Wis. 791.
- varieties, improved, Wis. 791.
- variety tests, Alaska 36; Del. 37; Iowa 37; Kans. 200; Mass. 643; Md. 643; N.Mex. 200; Nebr. 512; Oreg. 354; V.I. 512; Wyo. 791.
- weevil, discovery and history in Colorado, Colo. 397.
- weevil, physical ecology, 397.
- wilt resistance, Calif. 60.
- yields, effect of leaf destruction and clipping, 644.
- yields, variation in experimental plats, 199.

Alimentary tract, effect of bran, 749.

Alkali—

- problems, Calif. 16.
- reclamation, studies, Idaho 776.
- soils, reclamation, changes accompanying, 17.

Alkaloids, function in plant metabolism, 188.

Alkaptonuria, genetic basis, 32.

Allium spp. resistant to pink root, 670.

Almonds, mutations in, 28.

Almonds, pollination, Calif. 47.

Alophosternum, new genus, erection, 561.

Alternaria—

- blight of ginseng, control and injury from Bordeaux mixture, Ohio 374.
- dianthi*, notes, Mass. 663.
- solani*, notes, Ga.Coastal Plain 60.
- sp., notes, 373.

Alucitidae, life history, 392.

Alumina gel, extraction of malt amylase from, 633.

Aluminum—

- effect on color of hydrangea flowers, N.Y.Cornell 57.
- use in dairy equipment, 734.
- utensils, thickness as factor in thermal efficiency, 909.

Amaryllis red-burn disease, 822.

Amblyomma—

- americanum*, notes, 866.
- cajennense*, notes, 869.
- marginale*, notes, 866.

American—

- Association of Agricultural College Editors, meeting, 768.

American—Continued.

Dairy Science Association, proceedings, 412.

Society of Animal Production, proceedings, 404.

Amino acid, new, formation, 484.

Amino acids—

- and related compounds, absorption spectra, 165.
- dicarboxylic, relation to nutrition, 144.
- 5-carbon, interchangeability in nutrition, 145.
- transference and conductivity studies, 483.
- trivalent, peptides of, 5.

β -Amino-*n*-valeric acid, formation, 484.

Ammonia—

- aqueous solutions, fertilizing value, 185.
- in blood and other biological fluids, determination, 172.

Ammonification, effect of *Bacillus mycoides*, 779.

Ammonium—

- compounds in soil, adsorption, 340.
- sulfate, acidifying effects, N.J. 24.
- sulfate and sodium nitrate on lawns, comparison, R.I. 200.
- sulfate, movement in soil, 184.
- sulfite, effect on plant growth, 340.

Amphicoma vulpina, control, Mass. 687.

Amylase—

- activation by cyanide, 187.
- male, extraction from alumina gel, 633.

Anabesine—

- sulfate v. nicotine sulfate, toxicity for aphid and leafhoppers, Conn.State 546.

toxicity against mosquito larvae, 242.

Anabrus simplex, *see* Cricket, Mormon.

Anaerobes, reduced iron for cultivation, 866.

Analysis, chemical, *see* Chemical.

Anaplasma—

- marginale*, immunization against, 588.
- marginale* in northern Queensland, 866.
- morphology, 866.
- rossicum*, notes, 718.
- spp., pure strains by transmission through antelopes, 107.

Anaplasmosis—

- and nature of *Anaplasma*, 711, 866.
- bovine, method of obtaining pure strains of *Anaplasma* spp., 420.
- carriers, effect of splenectomy on blood, 267.
- experimental transmission, 269.
- identity and carrier problem, 582.
- in cattle in Louisiana, 426.
- in cattle, studies, 107; Calif. 104; Fla. 265.
- in sheep in Uralsk, 711.
- notes, Kans. 265.
- transmission, 910.

Anarsia lineatella, *see* Peach twig borer.

Anastatus—

- disparis* and *Ooencyrtus kuvanae*, interrelations, 86.

Anastatus—Continued.

semiflavivus, equipment and methods of rearing, 836.

semiflavivus, notes, 830.

spp., notes, 689.

Anastrepha ludens, see Fruit fly, Mexican.

Anchorage for reinforcing bars, tests, 723.

Ancyliis comptana, see Strawberry leaf roller.

Anemia—

in lambs, copper for, 406.

in lambs, development and cure, Iowa 89.

in pigs, Ind. 89.

in suckling pigs, 405.

in suckling pigs, prevention, N.Y.Cornell 90.

in suckling pigs, relation to blood picture, Minn. 93.

nutritional—

effect of feeding green leafy vegetables and cowpeas, 763.

effect of intraperitoneal injection of iron, 904.

in rats, production, 620.

use of metal cages in study, 763.

of pregnancy, types, 314.

pernicious, autolyzed liver, for, 314.

pernicious, single injection of concentrated gastric juice for, 314.

relation to vitamin D deficiency, 624, 762.

Aneristus—

asterole canii n.sp., description, 72.

hispaniolae n.sp., description, 72.

mangiferae n.sp., description, 72.

Anesthesia, extradural, in dogs and cats, 579.

Anetia dimmocki, notes, 84.

Aneurysms, dissecting, in swine, 432.

Angitia armillata, notes, 246.

Angoumois grain moth in Maryland, life history, U.S.D.A. 390.

Animal—

color and adornment, meaning, treatise, 824.

diseases—see also specific diseases.

bacterial, genetic resistance in, 347.

compendium, 265.

control, notable progress in, U.S.D.A. 697.

in Burma, 709.

in Canada, 578.

in East Africa, 580.

in Japan, 105.

in Nebraska, Nebr. 578.

in Punjab, 580.

infectious, diagnosis, Schilling's hemogram method, 579.

internal, clinical diagnosis, 577.

of laboratory animals, resistance and susceptibility, Iowa 104.

of small domestic animals, textbook, 709.

Animal—Continued.

diseases—continued.

spontaneous, of smaller laboratory animals, 596.

virus, 711.

fats, see Fats.

fibers, see Fibers.

husbandry institutions, international directory, 838.

husbandry, use of statistical methods, 405.

industry in British Empire, 610.

nutrition studies, N.Y.Cornell 89.

parasites, see Parasites.

populations, balance, 543.

shelters, ventilation, 124.

Animals—see also Cattle, Livestock, Mammals, Sheep, etc.

domestic—

hypocalcaemic morbid conditions in, 711.

parasites affecting, V.I. 585.

parasites of, treatise, 577.

sterility in, 33.

growth and development, Mo. 94, 407.

lymph-virus inoculated, selection, diseases, and handling, 578.

prices, numbers, and kinds changed since war, U.S.D.A. 697.

reproduction and inheritance studies, Kans. 193.

self-sterility and cross-sterility in, 33.

surface area, determination, 566.

variability and individuality, age factor in, 348.

Ankylostoma canina, effect of rotenone, 423.

Anomala orientalis, see Asiatic beetle.

Anopheles—see also Malaria and Mosquitoes.

infectivity, food, and breeding waters in Kenya, 81.

maculipennis—

racial differentiation in Netherlands, 81.

seasonal life history, 266.

two races, pattern of dorsal surface of ova, 558.

spp. of California, comparative study of eggs, 266.

walkeri, vector of *Plasmodium vivax*, 392.

Anophelism without malaria around Amsterdam, 558.

Antelopes, wild, carriers of nematode parasites of domestic ruminants, 420.

Antestia orbitalis lineaticollis, control, 551.

Anthelmintics, action on migration of ascarid larvae, 585.

Anthocyanin pigmentation, inheritance in Asiatic cottons, 783.

Antholcus varinervis, introduction into New Zealand, 549.

Anthonomus—

grandis, see Boll weevil.

quadrigibbus, see Apple curculio.

rubi, notes, 72.

Anthrax—

diagnosis, 710.

protection tests, 275.

symptomatic, *see* Blackleg.*Anthrax scylla*, notes, U.S.D.A. 83.*Anthrenus scrophulariae*, *see* Carpet beetles.

Antibody production, effects of vitamins A and D on, 149.

Anticarsia gemmatilis, *see* Velvetbean caterpillar.

Antigen production, new methods, 578.

Antineuritic vitamin, *see* Vitamin B (B₁).Antirachitic, *see* Rickets and Vitamin D.Antiscorbutic, *see* Scurvy and Vitamin C.

Ants—

house, studies, N.J. 246.

in seed beds, control, 826.

small brown, in golf greens, Ohio 72.

water-and-oil treatment against, 826.

white, *see* Termites.

Anuraphis—

amygdali and *A. persicae niger*, comparison, 239.*arundinariae* n.sp., description, 239.*iteae* n.sp., description, 239.*minima* n.sp., description, 239.*persicae niger*, *see* Peach aphid, black.*rosceus*, *see* Apple aphid, rosy.*Aonidiella aurantii*, *see* Orange scale.*Aonidiella citrina* and *A. aurantii*, comparison, Calif. 555.

Apanteles—

genus, revision of Ethiopian species, 398.

marginiventris, notes, 398.*molestae* n.sp., description, 399.

n.sp., notes, Mo. 79.

xanthopus, notes, U.S.D.A. 692.*Aphanomyces* sp., notes, Wis. 533.

Aphelenchus—

parietinus, notes, 228.*ritzema-bosi* on zinnia and dahlia, 70.

Aphididae, new genera and species, 388.

Aphids—

attacking potatoes in Wales, 238.

control, 73; Fla. 232.

on alfalfa, control, Calif. 37.

on fruit trees, control. 547.

toxicity of pentathionic acid to, 383.

transmission of cucumber mosaic by, Wis. 810.

transmission of onion yellow dwarf by, 828.

Aphis—

astricola n.sp., description. 239.*brassicae*, *see* Cabbage aphid.*caryaefoliae*, types, 239.*floridanae* n.sp., description, 239.*fumipennella*, types, 239.*gossypii*, *see* Melon aphid.*maidis*, *see* Corn leaf aphid.*persicae*, *see* Peach aphid, green.*persicae-niger*, *see* Peach aphid, black.*rumicis*, *see* Bean aphid.*spiraeicola*, notes, Fla. 231.

Apiaries, inspection, Conn.State 546.

Apiaries, inspection, efficiency and economy in, 87.

Apiculture, *see* Beekeeping.

Aplanobacter—

insidiosum, varietal susceptibility, notes, 530; Nebr. 531.*stewartii*, notes, U.S.D.A. 653, 669.

Apparatus—

for determining body of fluid cream, 853.

for studying temperature and climate around plants, 775.

fruit juice filter, Mich. 3.

manometric, applications and modifications, 171, 172.

micro conductance cell, description and drawing, 488.

Apple—

and thorn skeletonizer, 548.

aphid, rosy, tar distillate sprays for, 236.

bitter pit problem in Australia, 537.

blossoms in western New York, insects collected from, 686.

blotch, notes, Ind. 60.

branches, rapidly growing, formation of narrow crotch angles with trunk, N.J. 213.

capsid, biology, 72.

color, measuring with disc colorimeter, 655.

cork disease, N.Y.Cornell 61.

crosses, pollination experiments, 654.

curculio, control in Champlain Valley, 246.

curculio, notes, Kans. 232.

diseases in Quebec, control, 376.

fruit bud formation, effect of phosphorus, N.H. 364.

fruit color and condition, effect of soil moisture, 523.

fruit fly or railroad worm, notes, Me. 385.

graft overgrowths, effectiveness of adhesive tapes for, Wis. 810.

industry of New York State, effect of codling moth, 240.

industry, trends in, Wash. 453.

juice in various forms, vitamin C in, Mass. 747.

juice, sterilization with heat developed by resistance to alternating electric current, Iowa 143.

leaf variegation, infectious, 675.

leafhopper, notes, 384; Idaho 824.

leafhopper, white—

control, 384.

notes, Idaho 824.

seasonal life history and control, Conn.State 546.

spray tests for, 238.

leafhoppers, spraying for, 386.

leaves, assimilation of carbon dioxide by, 213.

Apple—Continued.

maggot—

- biology, 244.
- bionomics and control, Iowa 71.
- conference of New England, 384.
- control, 384; Mass. 686; N.H. 385.
- dispersal in 1932, 244.
- flies, effect of carbohydrates on longevity, Iowa 71.
- flies, trapping, 548.
- habits, 833.
- notes, Me. 385, 394; Wis. 825.
- viability of eggs and larvae, N.Y. State 394.

measles, notes, N.Mex. 222.

orchards—

- fertilizer experiments, N.Y.State 367.
- mulching with straw, Ind. 798.
- recovery from drought injury, effect of nitrogen fertilization, 654.
- soil management, Iowa 48.
- spraying and dusting, Ohio 49.
- wild insects in, N.Y.Cornell 72.
- redbug, tar distillate sprays for, 236.
- root borer, giant, notes, N.Mex. 232.
- roots, development, Ohio 49.
- sawfly control, dusting for, 561.

scab—

- control, 227, 820, 821; Me. 373; N.H. 373.
- control, difficulties in 1931, 675.
- control in Quebec, 377.
- control, lime-sulfur for, N.Y.State 377.
- control, success and failure in, Mich. 212.
- epidemic in 1932, 820.
- notes, N.Y.Cornell 61.
- spore development and sprays, 675.
- spray for, Conn.State 221.
- studies, 222.
- sulfur sprays for, Ohio 61.
- scald, control, oiled wrappers v. shredded paper, N.Y.Cornell 53.
- seedlings, chromosome numbers in, N.Y.State 347.
- seedlings, new varieties, 212.
- shoot moth, biology, 389.
- sooty blotch, spray for, Conn.State 221.
- spotting disease of Lord Wolseley and other varieties, 675.
- stocks, Ind. 48.
- storage, air-cooled, management, Ind. 116.
- sucker, control, 73.
- tree borer, flat-headed, control, 548.
- tree canker, perennial, in Canada, 536.
- tree crotches, breaking strength, 654.
- tree wound dressings, toxicity, relation to growth cycle, 55.
- trees, amount of mulch material required, N.J. 803.
- trees, fertilizer and cultural requirements, Mass. 652.

Apple—Continued.

- trees, filler, management, Pa. 802.
- trees, pruning, N.H. 364.
- trees, transplanted, growth, 802.
- trees, variations on seedling and on own roots, Del. 48.
- trees, winter injury to crotch and trunk, 803.
- wood, bound water and hardness in, Iowa 48.
- wood, water in and specific heat, correlation, 55.
- worm, lesser, in California, 232.

Apples—

- acreage, varieties, prices, and markets, Del. 126.
- age of maximum productivity in, Ohio 49.
- American species and varieties, N.Y. State 367.
- arsenical residue on, Conn.State 209; Ind. 48.
- arsenical residue on, removal, 684.
- ash constituents during growth, Ohio 213.
- Baldwin and McIntosh, vitamin C in various parts, 903.
- Baldwin, vitamin C in, 902.
- biennial bearing, relation to foliage system and fruit thinning, 801.
- blue mold injury to, N.Y.Cornell 61.
- breeding, 800; Idaho 798; Iowa 48.
- breeding, pollination, and selection studies, Me. 364.
- changes in cuticle during growth and storage, 368.
- cold storage at Highmoor Farm, Me. 437.
- composition and keeping quality, effect of nitrogen fertilizers, Iowa 48.
- cooling, use of ice for, Ind. 798.
- cork or drought spot in, 820.
- cost of washing, Ind. 48.
- crab, *see* Crab apple.
- cull, causes, Mo. 55.
- culture, short course in, 522.
- decay in storage, cause, 233.
- dropping, nature and causes, Del. 48.
- effect of cultural treatments, Ind. 48.
- effect of different soil types, N.Y.Cornell 53.
- fertilizer and pollination experiments, Md. 652.
- fertilizer requirements, Ohio 49.
- in sod and in cultivation, fertilizer requirements, N.H. 364.
- inhibitory substance in, effect on potato growth, Kans. 189.
- Jonathan, breakdown studies, 537.
- keeping quality, effect of packing and storage, Nebr. 520.
- keeping quality, relation to storage temperature, Iowa 48; N.Y.Cornell 53.
- Kendall, description, N.Y.State 367.
- Lane Prince Albert, gas storage, 803.
- maturity and storage, Idaho 798.

Apple—Continued.

- mountain, vitamins in, Hawaii 747.
- named seedlings, description, 799.
- new stocks for, development, Iowa 48.
- New York, culinary qualities, 890.
- New Zealand, fungi in overseas transport and marketing, 228.
- nitrogen fertilizer studies, Ohio 49.
- own rooted, methods of propagating, Iowa 48.
- pollen development, 799.
- pollination, Calif 47; Mass. 652; N.H. 364; N.Y.Cornell 53; W.Va. 212.
- preparing for market, U.S.D.A. 55.
- pruning, 522; Ind. 48; Mass. 652; Nebr. 520.
- pruning wounds, rate of healing, relation to tree vigor, 802.
- quality and bud differentiation, relation to leaf area and position, U.S.D.A. 54.
- red color in, development after harvesting, N.Y.Cornell 53.
- set, effect of sulfur fungicides during bloom, 802.
- size and color, effect of thinning, 801.
- spray schedules for, Mo.Fruit 654.
- stock and scion relations, Mass. 652; Wis. 798.
- storage—
 - aldehyde poisoning, 539.
 - effect of humidity on evaporation, Mass. 734.
 - fungus invasions, 539.
 - houses for, Iowa 48.
 - studies, Ind. 48; N.H. 364.
- treatise, 523.
- Turley, notes, Ohio 49.
- uniform rootstocks for, growing, Iowa 48.
- varieties, value as pollinizers, 800.
- variety tests, Fla. 209; Ga.Coastal Plain 48; Iowa 48; Mass. 652.
- vitamin C in, effect of fertilizers, 470.
- waxlike coating, changes in, 655.
- Winesap, vitamin C in, 470.
- xenia and metaxenia in, 29.
- yellow-tissued and white-tissued, vitamin A in, 758.
- York Imperial, biennial bearing in, possibilities, 801.

Apricots—

- canned, vitamin C in, stability relation to copper content, 153.
- Chinese, identified as old variety, 654.
- fresh and dried, effect of cooking on vitamins in, 757.
- hemoglobin regenerating potency, 473.

Aproctonema entomophagum, morphology and life history, 838.*Aptinotrips rufus*, life history, habits, and enemies, 553.

Arborvitae leaf miner, injury from, Conn. State 546.

Argas striatus n.sp., description, 420.*Argyresthia freyella*, notes, Conn.State 546.*Argyresthia thuiella*, see Arborvitae leaf miner.*Armillaria* root disease in tea, 540.*Armillaria* sp., notes, 526.

Army worm, beet, biology, 392.

Army worm, fall, notes, P.R. 825.

Army worms and defoliators, control, 548.

Arracacha, vitamin A in, 617.

Arrowgrass, toxicity, Wyo. 421.

Arsenic—

compounds, toxicity for sheep, 580.

in plant materials, determination, 493.

Arsenical—

bait sprays, effect on citrus trees, U.S.D.A. 73.

poisoning of fowls, 436.

residue—see also Spray residues, and specific fruits and vegetables.

toxicity to rats, Mo. 552.

Arsenicals for weed control, Calif. 37.

Arsenious acid and trisodium arsenite, relative toxicity to house fly, 244.

Arthritis—

experimental erysipelotheitic, in lambs, 430.

specific, in sheep, 580.

Ascariasis of horses, allergic reactions in, 579.

Ascaridia lineata—

age resistance of chickens to, 267.

in California Valley quail, 268.

mass treatment of poultry for, 593.

notes, Kans. 266.

resistance in poultry, effect of blood loss, 278.

resistance in poultry, effect of diet, 593.

studies, 266.

Ascaridia spp., N-butyldene chloride test for, 106.*Ascaris*—*equorum* in a colt, 268.*megaloccephala*, migration of larvae in horse, effect of anthelmintics, 585.*Ascogaster carpocapsae*, notes, 692.

Ascorbic acid—

and glutathione in animal tissues, estimation and distribution, 471.

and vitamin C, identity, 11, 169, 774, 902.

from plant material, method of obtaining, 773.

use of term, 11.

Ash trees in Wooster Arboretum, list, Ohio 217.

Asiatic beetle, distribution and importance, 83.

Asiatic garden beetle, distribution and importance, 83.

Asparagine—

effect on glutamine estimation, 492.

isolation from enzymic digest of edestin, 492.

Asparagus—

culture, Iowa 48.

fern, beet army worm on, biology, 392.

fern rust, notes, Fla. 221.

- Asparagus*—Continued.
 fertilization and culture, Mass. 652.
 fertilizer experiments, N.Y.Cornell 50.
 fresh, vitamin A and C in, Mass. 747.
 improvement, Calif. 48.
 variety tests, Ga.Coastal Plain 48.
- Aspergillus*—
flavus, ergosterol and mannitol from, 166.
flavus, relation to thermogenesis in stored hay, Iowa 27.
sclerotiorum, relation to apple decay, 674.
 spp., effect on jellying power of fruit juices, Mass. 633.
versicolor, growth on higher paraffins, 486.
- Aspidiotus perniciosus*, see San Jose scale.
- Association of Land-Grant Colleges and Universities—
 1933 convention, 160.
 proceedings, 746.
- Aster wilt resistance, Ind. 48.
- Aster yellows, transmission to new host plants, 386.
- Asterolecanium*—
coffae, control, 556.
variolosum, parasite of, 388.
- Asters*—
 China, cultural requirements, N.J. 807.
 effect of electric light supplementing daylight, Ind. 49.
 value of muslin coverings, N.Y.Cornell 57.
- Asynapta citrinae* n.sp. from Puerto Rico, 72.
- Ataenius cognatus* as intermediate host of *Hymenolepis cantaniana*, 267.
- Atlacide solution sprayed on weed plats, spontaneous combustion from, 651.
- Atmospheric moisture, see Humidity.
- Atmospherics in Australia, 495.
- Atopy, term defined, 897.
- Aujesky's disease—
 foci of virus, 867.
 transmission to young pigs, 860.
- Australia, economic survey, 290.
- Autoserica castanea*, notes, 83.
- Avitaminosis—see also Vitamins, deficiency.
 and latent dystrophies, 758.
 and unapparent dystrophia, 624.
 biochemistry and pathology, Ark. 758.
- Avocado—
 insects, control, 384.
 sun blotch, Calif. 60.
- Avocados—
 chemical composition and food value, 891.
 culture experiments, Hawaii 652.
 feeding value for poultry, Hawaii, 698.
 fertilizer experiments, Fla. 209; P.R. 798.
 landscape and windbreak tests, Fla. 209.
 maturity studies, Fla. 209.
 pollination, Fla. 524.
- Azalea insects and diseases, 687.
- Azotobacter*—
 effect of absolute reaction of soil solution, Kans. 179.
 oxidation by, characteristics, 486.
- Babesia bigemina*, life cycle in cattle tick, 697.
- Babesiella*—
berbera, specific against, 587.
bovis, notes, 718.
- Baby beef, see Cattle, baby beef.
- Bacillus*—
abortus—see also *Bacterium abortus*, *Brucella abortus*, and Abortion.
 penetration through skin, 273.
bronchisepticus, notes, 112.
carotovorus, notes, 531.
coagulans in spoiled evaporated milk, 416.
coagulans, notes, Iowa 98.
coli in privately owned rural water supplies, 736.
coli in raw and pasteurized milk, 262.
enteritidis, see *Bacterium enteritidis* and *Salmonella enteritidis*.
gigas, notes, 579.
mallei, agglutinability of strains, 434.
mycoides, relation to ammonification, nitrification, and soil fertility, 779.
oedematiens in South Africa, 420.
ovitoxicus—
 anaculture for immunization of sheep, 589.
 notes, 276.
 type of toxin from sheep intestine, identification, 588.
para-alvei, notes, 560.
radicicola, see Legumes, inoculation, and Nodule bacteria.
sordellii and *Clostridium oedematoides*, identity, 270.
welchii, classification, 105.
welchii, single-cell cultures, 589.
- Bacon—
 exports from United States, 1920-32, Ohio 600.
 quality, effect of corn germ, 409.
- Bacteria—
 anaerobic, see Anaerobes.
 antibiosis to smuts and other fungi, Minn. 222.
 butyl-acetone group, physiological studies, 324.
 in acid foods, importance of temperature on survival time, 306.
 in eggs, 596.
 in milk, soil, etc., see Milk, Soil, etc.
 lactic acid, sugar-fermenting abilities, nitrogen sources for, 263, 264.
 metabolism, 487.
 pathogenic fluorescent group and fire-blight organism, comparison, 68.
 variations in, symposium, 711.

Bactericides—

- composition, Conn.State 234.
- phenol coefficients, determination, Ohio 61.

Bacterins, autogenous, value against mastitis, 108.

Bacteriologic culture media, see Culture media.

Bacteriology—

- pitfalls in, 711.
- problems, application of statistics to, 6.
- textbook, 577.
- veterinary, manual, 709.

Bacteriophage—

- lysates of *Salmonella suipestifer*, antigenic properties, 276.
- relation to control of plant parasites, 373.

Bacterium—

- abortus*—see also *Bacillus abortus*, *Brucella abortus*, and Abortion.
- agglutination antigen, preparation, technic, 585.
- enteritidis*, notes, 710.
- melleum*, notes, 536.
- ovinum* n.sp., description, 717.
- paludis*, single-cell cultures, 589.
- phaseoli* on beans in shipment, 813.
- pseudotuberculosis rodentium*, studies, 110.
- pullorum*, see Pullorum disease.
- purificiens*, notes, 717.
- radicicola*, see Legumes, inoculation, and Nodule bacteria.
- sesami*, *B. solanacearum*, and *B. sesamicola*, comparative studies, 66.
- sesamicola*, *B. sesami*, and *B. solanacearum*, comparative studies, 66.
- solanacearum*, *B. sesami*, and *B. sesamicola*, comparative studies, 66.
- solanacearum*, notes, 533.
- suipestifer* bacteriophage lysates, antigenic properties, 276.
- suipestifer*, septicemia of pigs, 580.
- tolaasi*, notes, 375.
- translucens undulosm*, notes, 64.
- tularensis*, infection of quail by, 271.
- tularensis* of low virulence in nature, 712.
- tumefaciens*, inoculation experiments on celery roots, 62.
- vascularum*, notes, 225.
- welchii*, see *Clostridium welchii* and *Bacillus welchii*.

Bagworm, wattle, insecticidal dusts for tests, 78.

Bahia grass, growth and fertilizer formulas, Fla. 199.

Baking chemistry, colloidal aspects, 324.

Baking, laboratory, standardization, 461.

Banana—

- diseases in storage and transport, 538.
- fruit rot, new, in Palestine, 676.
- pitting disease, nature and control, 676.
- plant, composition and nutrient uptake, 215.

Bananas—

- dwarf, mutant types, 29.
- feeding value for poultry, Hawaii 698.
- Lacatan, identity of various sorts, 806.
- vitamin C in, 310.

Bank, Federal Land, of Springfield, loaning operations, analysis, N.Y.Cornell 134.

Banking business, movement to larger cities, Kans. 287.

Barium fluosilicate for tobacco flea beetle, 84.

Bark—

- aphid, notes, Fla. 231.
- beetles and fungi, interrelations, 560.
- beetles, destruction by predacious mite, 685.
- beetles, larval development, 835.
- borers, control in fruit and shade trees, 826.

Barley—

- acre values, Minn. 201.
- acreage increase, U.S.D.A. 644.
- Alpha, loose smut control, N.Y.Cornell 61.
- and wheat for pigs, grinding, 405.
- antirachitic properties, 755.
- breeding, Iowa 37; Kans. 200; N.Y. Cornell 38; Oreg. 354.
- covered and loose smuts, effect of depth of seeding, 666.
- culture experiments, Kans. 200.
- date-of-seeding test, Del. 37.
- development, heterozygous condition, effect of lethal factor, Colo. 29.
- diseases, control methods, 222.
- diseases, control, Wis. 811.
- feeding value compared with other grains, 840.
- fertilizer experiments, Del. 37.
- flour for cakes and muffins, 892.
- germination after years of storage, 363.
- growth, effect of high tension electric discharge on, 188.
- improved sorts, Md. 643.
- inheritance in, 190, 344.
- leaf blotch near Cambridge, England, 63.
- nematode infestation symptoms, 811.
- Ped. 38, improvement and yield tests, Wis. 791.
- plants, assimilation of phosphorus and potassium, 186.
- production, N.Dak. 203.
- production in Germany, effect of climate, 178.
- Pusa, yield trial, 40.
- rotation and tillage experiments, U.S. D.A. 789.
- scabbed, feeding value, Wis. 839.
- seed coat, permeability, factors affecting, 356.
- snow scald, notes, Idaho 810.
- stripe disease, nature and control, U.S.D.A. 62.
- structural constituents in, development, 645.
- survey of world, 605.

Barley—Continued.

- varieties on peat and sandy lands, Minn. 201.
- variety tests, Alaska 36; Ga.Coastal Plain 37; Idaho 788; Ind. 789; Kans. 200; Me. 353; N.Mex. 200; Nebr. 512; Oreg. 354; U.S.D.A. 789.
- variety-cultural experiments, Iowa 37.
- yield and composition, effect of stage of maturity when harvested, 793.
- yields, Ind. 789.

Barns—

- all-masonry, notes, Iowa 116.
- and corrals, asphaltic concrete surfacing for, Calif. 116.

Barter and scrip in United States, bibliography, U.S.D.A. 139.

Basic slag, *see* Phosphatic slags.

Basidiomycetes, systematization methods, 372.

Basisporium—

- ear rot and seed rotting, inheritance of resistance to, Iowa 60.
- gallarum*, pathogenicity to corn, Iowa 60.

Bass, base, culture, N.Y.Cornell 72.

Bassus—

- diversus* n.sp., description, 399.
- stigmaterus*, notes, U.S.D.A. 692.

Basswood canker disease, N.Y.Cornell 61.

Bathyplectes curculionis, parasite of alfalfa weevil, Colo. 397.

Bats, susceptibility to infection with horse trypanosome, 592, 712.

Bay oil, production, P.R. 49.

Bean—

- anthracnose, notes, Md. 663.
- aphid, vector of bean mosaic virus, 387.
- bacterial diseases in Bulgaria, 223
- beetle, Mexican:
 - control, Conn.State 231.
 - control, cultural practices in, 84.
 - control, insecticides for, 84.
 - enemies of, 245.
 - hibernation, 559.
 - precipitation as factor in emergence, 834.
- borers, lepidopterous, notes, P.R. 825.
- diseases, 526; Fla. 221.
- foliage, effect of commercial calcium arsenates, U.S.D.A. 683.
- halo-blight disease, varietal susceptibility in Poland, 812.
- leaves, effect of commercial calcium arsenate, 824.
- mosaic and curly top, notes, Idaho 810
- mosaic, notes, Wis. 810.
- mosaic virus, transmission, 387; N.Y. Cornell 61.
- pod borer, lima, notes, P.R. 825
- seed, irrigated v. dry-land, U.S.D.A. 789.
- seeds, soaking, after-effects, 653.
- thrips, biology, Calif. 826.
- weevil, effect of X-rays, 397.

Beans—*see also* Mung beans, Soybeans, Tepary beans, Velvetbeans, *etc.*

- anatomy, Mich. 51.
- breeding, N.Y.Cornell 38.
- canned green, vitamin C in, stability relation to copper content, 153.
- cost of production, Mich. 600.
- cull, feeding value, Wyo. 93.
- fertilizer and liming tests, Me. 364.
- fertilizer experiments, Ga.Coastal Plain 48; U.S.D.A. 789.
- improvement by selection, Mass. 652.
- insect punctures in, Idaho 824.
- insects affecting, 547.
- irrigation experiments, Idaho 871; N.Mex. 210.
- lima, culture experiments, Ga.Coastal Plain 48.
- lima, fertilizer experiments, Ga.Coastal Plain 48.
- lima, flour from for cakes and muffins, 892.
- lima, resistance to pests and diseases, Calif. 60.
- lima, variety tests, Ga.Coastal Plain 48.
- pinto, palatability on baking, N.Mex. 303.
- puncturing by *Lygus* spp., Idaho 828.
- rotation experiments, U.S.D.A. 789.
- row-spacing test, U.S.D.A. 789.
- snap, diseases occurring in shipment, 812.
- string, arsenical residues on, Conn. State 209.
- string, Florida, grading, packing, and stowing, Fla. 50.
- string, vitamin A in, 617.
- tests, V.I. 520.
- urd, in India and Burma, 795.
- varieties on peat land, Minn. 201.
- variety and strain tests, Me. 364.
- variety tests, Ga.Coastal Plain 48; Hawaii 643; N.Mex. 200.

Beauveria—

- bassiana* affecting coconut leaf miner, 832.
- globulifera*, notes, 560.

Bee allergen, air-borne, hypersensitiveness to, Minn. 318.

Beech—

- in Northeastern States, merchantable height table, 218.
- scale and a fungus, 232.

Beef—*see also* Cattle, beef.

- color in, measurement, 406.
- effect of fat on shrinkage and speed in roasting, 891.
- exports, quality requirements in, 450.
- from calves and yearlings, effect of sex, Iowa 89.
- lipin fraction, antagonism of monovalent and polyvalent metals in, Kans. 248.

Beef—Continued.

- production and grade, relationships among factors, 406.
- tallows, glyceride structure, 253.
- vitamin B in, effect of cooking and canning, 468.

Beekeeping—

- developments in, 87.
- equipment, chlorine sterilization, Minn. 246.
- manual, 836.
- studies, Calif. 71.

Bees—

- buckeye poisoning, 87.
- changes in nectar concentration produced by, 87.
- flight from different kinds of colonies, N.Y.Cornell 72.
- for orchards, 386.
- foulbrood, *see* Foulbrood.
- jungle, of largest island in Gatún Lake, 560.
- losses from buckeye poisoning, Calif. 71.
- mite disease, decade of, 233.
- paralysis in, transmission, 87.
- poisoning by false hellebore, 87.
- pollen distribution by, improved device to facilitate, 799.
- races and stock replacement, Iowa 71.
- studies, Kans. 232.
- time and labor factors in gathering, ripening, and storing honey by, Iowa 71.
- value in pollination, 385.

Beet—

- army worm, notes, Fla. 231.
- army worm predators and parasites, biology, 398.
- leafhopper, field observations in California, Calif. 554.
- leafhopper, notes, Idaho 824.
- pulp, dried and wet, feeding value, Wyo. 92.
- pulp, dried, value for pigs, 567.
- pulp v. molasses for milk production, P.R. 849.
- sugar factory waste waters, purification, 734.

Beetles—

- and damage to hides and leather, notes, 695.
- British, handbook, 395.

Beets—

- breeding, Conn.State 209.
- cross blockers for, Calif. 116.
- effect of rye and oat straws, 183.
- field or fodder, *see* Mangels.
- improvement by selection, Mass. 652.
- sugar, *see* Sugar beets.
- variety tests, Alaska 36.

Begonia leaf nematode disease, N.Y.Cornell 61.

Belascaris marginata, effect of rotenone, 423.

Bemisia—

- gossypiperda*, vector of zinnia leaf curl, 828.
- sp., notes, 673.

Bentgrass—

- for lawns, variety tests, Kans. 200.
- Rhode Island, seed production, effect of fertilizers, R.I. 200.
- variety tests, R.I. 200.

Benzoylaminocinnamic acid derivatives, addition of mercaptan to, 4.

Beprata cubensis, description, 72.

Berlin rings, nature, 580.

Berries, *see* Fruits, small, and Raspberries, Strawberries, etc.

Bibliography of—

- abortion in cattle, relation to trichomonads, 712.
- actinomycosis, 269.
- agricultural credit in United States, 289.
- agricultural meteorology, 13.
- agriculture in southern United States to 1860, 449.
- Babesia bigemina* in cattle tick, 697.
- barter and scrip in United States, U.S. D.A. 139.
- beet leafhopper, Calif. 555.
- birds, 381.
- birds of Newfoundland Labrador, 381.
- blood groups in fowls, 719.
- blood, respiratory function, evolution, 383.
- blowflies, culture of sterile maggots, 83.
- blowflies, sheep, of Australia, 557.
- boll weevil, ingestion of poison by, Tex. 836.
- Brachymeria fonscolombi*, U.S.D.A. 837.
- bran, laxative effect, 750.
- British and Irish writers on agriculture, 318.
- Calliphoridae of New Zealand, 244.
- caterpillars, urticant spines of, 389.
- cestodes, avian, 545.
- chutes, 120.
- clover seed midge, control, 393.
- corn ear worm insect enemies, 242.
- cotton genetics, 344.
- cotton, uses, U.S.D.A. 620.
- crane fly larvae, 393.
- Culex pipiens*, 833.
- drainage, mole, 118.
- entomology of Australia, 549.
- entomology, Puerto Rican, 548.
- farming, group and chain, U.S.D.A. 603.
- foods, frozen, microbiology, 463.
- fungi of India, 373.
- game management, 543.
- gases, mixed, toxicity to insects, 825.
- helminthiasis prophylaxis, action of vitamin A in, 268.
- helminthology for 1931, 268.
- Heterakis gallinae*, 281.

Bibliography of—Continued.

- Heterodera* genus, 542.
 home economics education, suggestions for, 142.
 hybridization in red clover, 193.
 insect pests, ecological studies, relation to distribution and abundance, 231.
 insects, injurious, in Russia, 825.
 insects, populations, 382.
 insects, senses, 545.
 John's disease, 857.
 laryngotracheitis, infectious, immunology, Mass. 862.
 leucosis of fowls, 280, 595.
 locusts, desert, in Egypt, 688.
 lungworms, bursate, of livestock, 865.
 mal de caderas of cattle in Paraguay, 273.
 mammalogy, economic, 381.
 metals in food and biological material, 148, 752.
 Muscidae of New Zealand, 244.
 nematode genus, parasitic, affecting Primates, 545.
 nematodes parasitic in alimentary tract of sheep, 590.
Nepticula braunella n.sp., 242.
 orange juice, canning, 615.
 orange scale, Calif. 555.
 paralysis of fowls, 594, 720.
 pasteurellosis paresis of cattle, 273.
 phosphate rock, composition and distribution, U.S.D.A. 780.
Phytophthora distribution, Mo. 529.
 piroplasmosis, bovine, in British Columbia, 588.
 piroplasmosis in northern Queensland, 867.
 pneumonia in animals and bronchopneumonia and influenza in man, 424.
 precipitin tests in zoology and medicine, 422.
 prices, farmers' response to, U.S.D.A. 739.
 radio waves, effect on temperature of insects, 231.
 range conditions in Wood Buffalo Park of Canada, 681.
 rinderpest, 424.
 Rocky Mountain spotted fever tick, Mont. 247.
 sawfly, birch leaf-mining, Conn.State 399.
 scrip and barter in United States, U.S.D.A. 139.
 sodium hydroxide, 423.
 sparrows, song, sex relations, 682.
 sterility in domestic animals, 33.
 sterility in plants and animals, 33.
 stomach worms, control, 718.
 streptococci related to mastitis, 715.
 teeth decay, 475.
 tubercle bacilli, 425.
 tumors, transmissible, of fowls, 436.

Bibliography of—Continued.

- ultraviolet radiation, effect on seed plants, 782.
 viruses, filtrable, in vitro cultivation, 865.
 vitamin A relation to carotene, 151.
 vitamin C, chemical nature, 631.
 vitamin E, 904.
 vitamins, chemistry of, recent advances, 630.
 wheat, spring and winter, responses to day length and temperature, 650.
 yellow fever vectors, 393.
 Zoocercidia of plants in South and Central America, 382.
 Bidens borer, biology, 389.
 Bile, relation to absorption of irradiated ergosterol in dogs, 312.
 Billbug, low-tide, life history and distribution, 85.
 Bindweed—
 control by chlorate sprays, Kans. 200.
 control with arsenicals, Calif. 620.
 Bioclimatogram, notes, 234.
 Birch—
 and white pine forest, soil temperatures and evaporation, 58.
 leafmining sawfly, control, 685.
 Bird control, meaning, 382.
 Birds—
 anatomy, physiology, and adaptation, treatise, 381.
 cestodes infesting, 545.
 game, in captivity, habits and management, 256.
 game, of Missouri, survey, 543.
 nest, parasites from, 73.
 of Battle River region, 230.
 of Indian Empire, nidification, 682.
 of New England, portraits, 230.
 of New Zealand, life histories, 544.
 of Newfoundland Labrador, 381.
 of Nippon, 230.
 of South China, 230.
 value to cranberry industry, 543.
 winter, attracting to garden and home grounds, N.J. 682.
 Births, multiple, and sex ratios in cattle, 640.
Biscirus lapidarius, predator of clover springtail, 552.
 Black fly, blood-sucking, transmission of *Leucocytozoon anatis* in ducks by, 281.
 Black water fever, studies, 392.
 Blackberries—
 breeding, R.I. 210.
 named seedlings, description, 799.
 varieties, jelling properties, Fla. 303.
 variety tests, Ga.Coastal Plain 48.
 Blackberry—
 mite, control, Wash. 561.
 orange rust, notes, N.J. 373.
 Blackhead in turkeys, Nebr. 578.
 Blackhead in turkeys, prevention, 863.
 Blackhead in turkeys, prevention, value of tobacco powder, Kans. 249.

Blackleg—

- in calves, lesions in cardiac muscle as sole evidence, 714.
- in sheep, control, 580.
- in sheep due to shearing wounds, 109.
- notes, Kans. 265.

Blackstrap molasses for Louisiana work mules, 405.

Blapstinus substriatus, notes, Mont. 232.

Blister beetles, relation to bees, 395.

Blood—

- ammonia determination in, 172.
- as index of health and body functions, Idaho 839.
- avian, leucocyte counts, method for making, 278.
- bactericidal power, differences within inbred strain of rats, 194.
- bactericidal power, effect of vitamins, 624.
- bovine, constituents, 585.
- carbon dioxide tension and pH determination, 171.
- cholesterol in dogs on vitamin A-deficient diet, 468.
- cholesterol of women, 752.
- coagulation, effect of esophagus extract of *Bunostomum trigonocephalum*, 589.
- flour v. skim milk powder for calves, Ohio 99.
- formation, effect of diet, 892.
- from bred rabbits, effect on immature rabbits, 643.
- gases in, determination, 172.
- glutathione, determination, 172.
- groups in domestic animals, inheritance, 640.
- groups in fowls, 719.
- groups in horses, 580.
- groups in rabbits, 510.
- groups in rabbits, inheritance, 195.
- hemoglobin derivatives in, spectrophotometric constants, 633.
- human, sulfur in hemoglobin preparations, 327.
- iodide determination in, 633.
- letting and transfusion in animals, 579.
- lipids, effect of deficiency of vitamins A and D, 618.
- of healthy and diseased horses, 578.
- of infants, hemoglobin content, Wis. 890.
- of lactating and dry cows, fatty compounds in, N.Y.Cornell 99.
- of livestock, ketones in, 715.
- of patients with pituitary tumors, absence of gonad-stimulating hormone, 350.
- oxygen and carbon monoxide in, determination, 172.
- picture, peripheral, effect of stimulation of spleen of horse, 710.
- pressure in cecal obstruction of the horse, 710.
- pressure in horses, 580, 711.

Blood—Continued.

- pressure measurement of diseased horses, 579.
- quantity in animals, 579.
- regeneration, *see* Hemoglobin.
- respiratory function, evolution, 383.
- samples, drawing and handling for diagnosis of abortion, Conn.Storrs 107, 157.
- serum, hemolytic and precipitating, preparation, Mich. 5.
- serum, sodium in, determination, 331.
- sugar of dairy cattle, Kans. 257.
- sugar of lactating cows fed rations of varying fat content, 849.
- tumors in fowls, notes, 105.
- volume studies in cobalt polycythemia, 754.

Blowflies—

- activity at various heights, 834.
- in wooden olfactometer, olfactory responses, 557.
- larval parasite, life history and bionomics, U.S.D.A. 837.
- rearing and culture of sterile maggots, U.S.D.A. 83.
- sheep, of Australia, 557.

Blowfly larvae—

- enzyme from, which digests collagen, 559.
- fed on fatigued frog muscle, growth stimulation, 694.
- sterile, for treatment of osteomyelitis, food requirements, 394.
- use in treatment of osteomyelitis, U.S.D.A. 83.

Blueberries—

- adaptation and selection experiments, Ga.Coastal Plain 48.
- culture, Me. 364; Wash. 215.
- pollination, Me. 385.
- variety tests, Ga.Coastal Plain 48.
- vitamin C in, Mass. 747.

Blueberry—

- diseases, Me. 373.
- fruit worm, notes, Fla. 231.
- maggot, dusting experiments, 83.
- maggot parasite, biology, 85.

Bluebonnets, Texas, new damping-off disease, Tex. 541.

Bluegrass, bulbous, taxonomy and morphology, 645.

Bluegrass, Kentucky, vitamin A in, 412.

Bluegrass pasture, response to mineral fertilizers, Wis. 791.

Bobwhites, *see* Quail.

Boll weevil—

- control, Fla. 231.
- ingestion of poison by, Tex. 836.

Bollworm, pink—

- control, 548; V.I. 512.
- notes, P.R. 825.

Bone development, specific action of cereals on, 755.

Bone, ground, analyses, N.J. 24.

Bones, metatarsal, case of traumatism affecting, 421.

Books on—

agricultural credit in United States, history and theory, 288.
 agricultural legislation, 448.
 agricultural policy, American, 600.
 agricultural systems of middle Europe, 602.
 agriculture in southern United States to 1860, history, 448.
 agriculture of British Empire, 449.
 agriculture of world, 290.
 animal color and adornment, meaning, 824.
 animal diseases, internal, clinical diagnosis, 577.
 animal diseases of small domestic animals, 709.
 animals, domestic, parasites of, 577.
 apples, 523.
 bacteriology, 577.
 beekeeping, 836.
 beetles, British, 395.
 birds, anatomy, physiology, and adaptation, 381.
 botany, 341.
 bulbs, commercial, growing, 216.
 butterflies of Australia, 388.
 cheese, 419.
 chemistry, applied, 747.
 chemistry, physiological, 25, 142.
 clothing, 303.
 concrete, reinforced, construction, principles, 283.
 conifers, cultivated, in North America, 525.
 cookery, national, 892.
 dairy manufacturing machinery, 123.
 delphiniums, history and cultivation, 216.
 dietetics in warm climates, 750.
 education, adult rural, 302.
 entomology, 545.
 entomology, applied, problems, 545.
 eugenics, evolution, and genetics, 344.
 evolution, creative, mechanism, 190.
 evolution, genetics, and eugenics, 344.
 farm buildings, 123, 880.
 food, health, vitamins, 303.
 food in health and disease, 889.
 food purchasing for the home, 477.
 foods, 303.
 foods, microbiology, 746.
 forest education, 370.
 forestry, 59.
 forestry, an economic challenge, 660.
 game management, 543.
 gardens, 524.
 gardens of fragrance, 216.
 genetics, evolution, and eugenics, 344.
 greenhouses, 124.
 hematological diagnosis, 709.
 hotbeds, 124.
 hydraulic machinery, 874.
 ice cream, manufacture, 707.
 immunology of parasitic infections, 577.
 insect behavior, 382.

Books on—Continued.

irrigation practice and engineering, 720.
 lands, public, and resources in United States, 451.
 lilacs, 524.
 livestock production, 141.
 living in our homes, 303.
 mammalogy, economic, 381.
 marketing, 459.
 molds, classification, 189.
 parasitology of domestic animals, 577.
 pathology, 865.
Penicillium group, classification, 189.
 plant diseases, 219, 663.
 plant dispersal throughout world, 187.
 plant physiology, 341.
 plants, aquatic, 216.
 plants, nomenclature, 504.
 plants, tropical and subtropical agricultural, 28.
 population trends in United States, 458.
 rabbits, 847.
 rabbits, Angora, 572.
 rock gardens, 524.
 roses, 369.
 rural community, sociological study, 300.
 Sachs, Julius, 341.
 shrubs and trees for the garden, 525.
 social trends, rural, 299.
 statics, graphic, 119.
 sterility in plants and animals, 33.
 structural frames, continuous, of reinforced concrete, 120.
 structures, stresses in, 120.
 sugar terms in twelve languages, 361.
 sweet peas for all purposes, 524.
 tractors, farm, 122.
 tree surgery, 522.
 trees and shrubs for the garden, 525.
 turkeys, raising, 704.
 van Leeuwenhoek, Anthony, and his "little animals", 545.
 vitamins in health and disease, 897.
 water gardens, 216.
 water lilies, 216.
Boophilus—
 annulatus, see Cattle tick.
 annulatus australis in Texas, 400.
 australis, notes, 588.
Booponus intonsus, notes, 826.
 Bordeaux mixture—
 for blossom blight prevention, Oreg. 365.
 modifications, 664.
 on ginseng, blight control and injury, Ohio 374.
 Boron requirements of lettuce, 366.
Borrelia spp., proposed terminology, 270.
 Botanical-serological studies, 343.
 Botany, textbook, 341.
 Botelho's test in veterinary practice, 578.
 Botflies, see Sheep botfly.
 Botfly, horse, life history, 268.
Botryodiplodia spp. on elms in United States, 379.

Botrytis—

blight of calendula and snapdragon, N.Y. Cornell 61.

cinerea and species problem, 372.

cinerea as potential agent of root rot, 672.

cinerea, notes, 676.

cinerea on beans in shipment, 813.

delacroixii, notes, U.S.D.A. 692.

Boutonneuse fever and Rocky Mountain spotted fever, immunological relation, 583.

Boxelder bug as household pest, Mich. 553.

Brachycaudus amygdali and *Anuraphis persicae niger*, comparison, 239.

Brachymeria—

fonscolombei, biology, U.S.D.A. 837.

minuta, notes, 247.

Brachyrhinus sulcatus, see Vine weevil, black.

Bran, laxative effect, 749.

Branding fluids, suitability, Calif. 88.

Braula coeca, internal structures, Minn. 318.

Braxy of sheep in Germany, 716.

Braxy, vaccination with formolized whole cultures, 109.

Braxy-like disease of sheep, immunization, 589.

Bread—see also Flour.

mold growth in, new facts, Minn. 462.

yeast, of different kinds, vitamin B (B₁) in, Kans. 308.

Breeding, see Plant breeding and specific animals and plants.

Bregmatothrips iridis in United States, 824.

Bremidae of Manitoba, 398.

Brevicoryne brassicae, see Cabbage aphid.

Brewers' grains, artificially dried and pressed, feeding value, 258.

Brick masonry beams, reinforced, shear tests, 283.

British Agricultural Economics Society, papers and discussions, 737.

Broccoli—

bacterial soft rot, 531.

cooking, iron loss in, 615.

life history, 210.

vitamin B and G in, 308.

Brome grass, analyses, Alaska 36.

Bromides in presence of excess of chlorides, determination, 330.

Bromine, effect on tobacco plant, 649.

Bronchitis—

due to a streptococcus, Mass. 709.

infectious, see Laryngotracheitis.

Broomcorn—

production, U.S.D.A. 293.

situation, Okla. 288.

variety tests, V.I. 512.

Brown bast, nature of, 379.

Brown rot fungi, studies, 376.

Brucella abortus—see also Abortion, *Bacillus abortus*, and *Bacterium abortus*.

agglutinins, persistence in calves from reacting cows, 585.

Brucella abortus—Continued.

avirulent strain, efficacy for vaccinating pregnant cattle, 427.

bovine and porcine strains, differentiation, 867.

dissociation in, 867.

germicidal efficiency of lye against, 107.

immunity in heifers injected with living cultures, Ind. 104.

in bulls, 579.

in cattle, relation to agglutinins in milk and blood, Ohio 104.

in horses, 111, 433, 591.

in town milk supplies, 427.

infection, effect on normal udder, 586.

skin as portal of entry for, 713.

strains recovered from milk, 713.

strains, vaccines from, efficacy and safety, 427.

transmission by fecal feeding flies, N.Y., Cornell 72.

Brucella—

and *Pasteurella* organisms, absence of serological relations, 423.

group, dissociation, 270.

infection in dogs, 111.

infection in domestic animals, relation to undulant fever, 870; Va. 869.

infection in goats, Ind. 104.

infection in man, Huddleson slide test v. two tube test, 584.

strains, homologous and heterologous, agglutinability, 426.

strains, interrelation, 427.

strains of human origin, identification, 582.

suis infection in swine and employees of packing houses, 718.

suis, longevity in anti-hog-cholera serum, 431.

Bruchus—

brachialis in United States, 696.

obtectus, see Bean weevil.

pisorum, see Pea weevil.

Brunella vulgaris mosaic disease, 220.

Brush in pastures, eradicating, R.I. 200.

Brussels sprouts—

Fusarium resistance in, inheritance, 813.

hardiness in, N.H. 638.

hardiness in, relation to hydrophilic colloids, 365.

resistance to yellows, inheritance, Wis. 810.

Buckeye poisoning of bees, 87; Calif. 71.

Buckeyes in Wooster Arboretum, list, Ohio 217.

Buckwheat—

flour for cakes and muffins, 892.

in culture solutions, nitrogen absorption from, 501.

seeds, microphotography, 363.

Buffalo grass, culture experiments, Kans. 200.

- Building materials and structures, fire resistance, testing, 125.
- Bulb fly larvae, control on narcissus bulbs, 823.
- Bulbs—
commercial, growing, treatise, 216.
flowering, variety tests, Ga.Coastal Plain 48.
- Bulls—*see also* Sires.
serum protein and variations during rinderpest, 868.
- Bumblebees, distributional ranges in Manitoba, 398.
- Bunostomum trigonocephalum*, anticoagulin in esophagus of, 589.
- Bunt, *see* Wheat smut, stinking.
- Bupalus piniarius*, notes, 233.
- Bureau of Plant Quarantine, directory of field activities in 1933, U.S.D.A. 664.
- Burgundy mixture, preservation, N.H. 373.
- Butanol, production from molasses, P.R. 771.
- Butter—
bacteriology, Iowa 575.
color and vitamins in, effect of artificial dried hay fed to cows, 320.
color, market preferences for, Wis. 848.
coloring from annatto seed, effect on vitamin A in butter, Ind. 150.
cultures from mixtures of organisms, development, Iowa 98.
cultures, preparing for mail shipment, methods, Iowa 98.
cultures, relation to acetylmethylcarbinol and diacetyl, Iowa 103.
from standpoint of colloid chemistry, 324.
improvement program, Idaho 848.
keeping qualities, factors affecting, Ind. 98.
keeping qualities, relation to enzymes in cream, Ind. 98.
keeping quality, relation to numbers and types of bacteria in, Iowa 98.
made from plastic cream, defects, Wis. 848.
microscopic examination, method, Iowa 98.
rancidity in, organism causing, Iowa 98.
standardization, Iowa 98.
starter v. nonstarter, 576.
sticky, crumbly, cause, Calif. 97.
surface taint in, micro-organisms causing, Iowa 98.
vitamin A in, effect of ultraviolet light, Ind. 150.
wrapping, new types, Wis. 848.
- Butterfat—
from Guernsey and Ayrshire breeds, vitamin A in, Ind. 98.
production, effect of nutrition, Nebr. 572.
sources in Ohio, Ohio 742.
- Butterfat—Continued.
treatment with charcoal, effect, Ind. 150.
vitamin A in, 418.
- Butterflies of Australia, guide, 388.
- Buttermilk—
Babcock tests of fat in, factors affecting, Iowa 98.
cultured, manufacture, S.C. 854.
fat losses, effect of acidity in cream, Iowa 98.
feeding value for laying hens, Ind. 89.
- Butyl alcohol—
biological production, factors in, 5.
production, stimulative substance useful in, Wis. 771.
- N-Butylidene chloride, new anthelmintic, 106.
- Byturus tomentosus*, control, 695.
- Cabbage—
aphid, outbreak, 73.
aphid, vector of bean mosaic virus, 387.
arsenical residues on, Conn.State 209.
autumn v. winter sowing, 521.
breeding experiments, Del. 365.
butterfly, ecology and epidemiology, 233.
calcium in, 753.
Chinese raw and bran-salted, vitamins A and B in, Hawaii 747.
clubroot, control, Conn.State 221.
culture, U.S.D.A. 51.
diseases in Florida, 223.
drought injury, N.Y.Cornell 61.
duty of water for, N.Mex. 282.
fertilizer experiments, Ga.Coastal Plain 48; N.Mex. 210.
Florida, grading, packing, and stowing, Fla. 50.
growth, effect of electricity, 877.
hardiness in, N.H. 638.
hardiness in, relation to hydrophilic colloids, 365.
Jersey Wakefield, yellows - resistant lines, 531.
life history, 210.
premature flower stalk formation, Del. 48.
sick soil, substitute crops for, Iowa 48.
time of planting, N.H. 364.
worm, imported, biology, 690.
worm, imported, near Philadelphia, 239.
worm, notes, Ind. 71.
yellows, notes, N.J. 373.
yellows or wilt, physiology of parasitism in, 531.
yellows-resistant, breeding, Iowa 60; Wis. 810.
- Cacao—
beans and *Ephestia elutella*, 390.
beans, vitamin D in, 310.
culture in Ecuador, 624.
insects affecting, 549.
- Caconema radicola*, notes, 228.

Cakes, test sponge, measuring and recording characteristics, 462.
 Cakes without wheat, 892.
 Calciferol properties, 631.
 Calcium—*see also* Lime.
 absorption, effect of irradiated ergosterol, 312.
 and phosphorus levels, effect on composition of blood and bone, Idaho 839.
 and phosphorus relation, effect on growth, calcification, and blood composition of rats, 147.
 and phosphorus, relation to growth and rachitic leg weakness in chickens, 570.
 arsenate, commercial, effect on bean foliage, 824; U.S.D.A. 683.
 arsenate, response of soil types to, 187.
 bentonite and sand mixture as growth medium in pot culture, 782.
 carbonate and calcium sulfate, effect on bone development, 846.
 chlorate sprayed on weeds, spontaneous combustion from, 651.
 chloride as forest fire retardant, 661.
 cyanamide for clubroot control, Conn.State 221.
 determination in mineral mixtures, 489.
 from milk and milk products, utilization, Kans. 304.
 in cabbage, 753.
 intake by tobacco plants, factors in, 649.
 metabolism, effect of parathyroid hormone and irradiated ergosterol, 311.
 metabolism experiments on human subjects, 753.
 mobilization and excretion after overdosage with irradiated ergosterol, 312.
 of blood, changes in, relation to diet, Calif. 88.
 of brain in rickets and tetany, 155.
 ration, low, effect on reproduction in cattle, Minn. 258.
 relation to tobacco growth, Conn.State 518.
 retention in children, effect of irradiated ergosterol, 312.
 serum, diffusible by high pressure ultrafiltration, 170.
 serum, effect of small doses of irradiated ergosterol, 312.
 sources for pigs, Iowa 89.
 supplements, different, value in animal feeding, 406.
Calendra granaria, *see* Granary weevil.
Calendra setiger, life history and distribution, 85.
 Calendulas—
 effect of electric light supplementing daylight, Ind. 49.
 value of muslin coverings, N.Y.Cornell 57.
 Calf, rare double monster, 711.

Calf shelters, ventilation and lighting requirements, Idaho 871.
 Caliche type of calcareous hardpan in southwestern United States, 180.
 California—
 Station, notes, 478, 767.
 Station, report, 157.
 University, notes, 478, 910.
 Calla lily soft rot and root rot, control, N.Y.Cornell 61.
 Calla *Phytophthora* disease, 378.
 Calliphora *erythrocephala*—
 larvae fed on fatigued frog muscle, 694.
 olfactory response, 557.
 Calliphoridae of New Zealand, biology and economic status, 244.
 Calluna *vulgaris*, nonsymbiotic germination, N.Y.Cornell 25.
 Calves—
 baby beef, shipped from Union to Portland, shrinkage, Oreg. 407.
 beef, fattening, grain mixtures for, Nebr. 562.
 blood flour v. skim milk powder for, Ohio 99.
 creep feeding, Nebr. 562.
 fattening, Iowa 89.
 feeding methods, Idaho 848.
 grinding grains for, value, 849.
 growth, V.I. 572.
 milk as sole diet for, Kans. 257.
 milk substitutes for, Mass. 705.
 of reactor cows, persistence of *Brucella* agglutinins in, 585.
 primary complex in, 578.
 rachitic and nonrachitic, phosphorus partition in blood, 258.
 raising on dry concentrates, N.Y.Cornell 99.
 raising without roughage, Calif. 97.
 range, creep-feeding, Tex. 91.
 relation of dietary fat and fat derivatives in feces, 405.
 vitamin D requirements, Wis. 839.
 vitamin requirements, 563.
 wintering rations, Nebr. 562.
 Camel hybrids, histological structure of testes in, 787.
 Canavalia spp., pod and seeds structure, 775.
 Cancer susceptibility in mice, inheritance, 788.
 Cane weevil, silky, control, 548.
 Canned foods, vitamins in, 619.
 Canning—
 crops, diseases, Minn. 529.
 drying, and preserving, quality progress in, U.S.D.A. 652.
 methods, home, Ind. 143.
 Cantaloup, *see* Muskmelon.
 Capillaria spp. from English domestic fowls, 436.
 Caplin fish, dried, v. tankage as protein supplement for swine, 406.
 Carbohydrate, specific, from tubercle bacilli, 487.

Carbohydrates—

- and organic acids in succulent plants, interrelations, 187.
- in plants, determination, methods, Ind. 48.
- metabolism, 751.

Carbon—

dioxide—

- diffusion through soils, 496.
- in gas mixtures, determination, 171.
- storage, 50.

disulfide emulsion for root knot nematode, Mass. 220.

disulfide, toxicity to wireworms, effect of temperature, 835.

monoxide, determination in blood sample, 172.

monoxide, determination in gas mixtures, 172.

tetrachloride—

efficiency against stomach worms, 717.

injection for control of bark beetles, 836.

poisoning in horses, symptoms, 710.

Carcinomas in federally inspected establishments, 868.

Carnation—

bacterial leaf spot, N.Y. Cornell 61.

blight, notes, Mass. 663.

Carnations, effect of plant nutrients, Mass. 652.

Carotene—

and vitamin A, relation, 151, 467.

derivative giving same absorption band as vitamin A, 324.

in endocrine glands of cattle, 467.

in mangoes, 151.

role in cure of sinus infections, 467.

Carotenoids—

and vitamin A, 150.

role in animal body, 467.

Carpenter worm, control, 547.

Carpet beetles—

and clothes moths, N.J. 242.

naphthalene as fumigant for, 237.

Carpocapsa pomonella, see Codling moth.

Carpophilus hemipterus, see Fruit beetle, dried.

Carrot—

leaf blight, notes, Fla. 221.

leaf spot and blight, control, Ohio 61.

rust fly, biology and control, Mass. 686.

rust fly, naphthalene tests for, N.Y. Cornell, 72.

soft rot, notes, Calif. 60.

Carrots—

effect of rye and oat straws, 183.

for livestock, culture and harvesting, U.S.D.A. 354.

improvement, Calif. 48; Mass. 652.

injury, 232.

variety tests, Alaska 36; Oreg. 354.

vitamins in, effect of cooking, canning, and storage, 617; Mont. 898.

Casein—

and ammonia as emulsifying agent for oil emulsions, 826.

effect on kidney, relation to vitamin B complex, 152.

making, improved methods, Idaho 848.

phosphorus content, 11.

properties, technologically useful, 324.

spreader, effect on lime-sulfur injury, 685.

Caseinogen, peptic digest of, 418.

Cashew nuts, tests, V.I. 520.

Cassava, vitamin A in, 617.

Castor-bean—

plant, toxicity to Japanese beetle, 73.

tick on sheep, control, 694.

tick, transmission of tick-borne fever of sheep by, 590.

tick, vector of new sheep disease, 110.

Castor pomace, nitrification, Mass. 634.

Castration leaving epididymis intact, effect on rats, 350.

Cat, tortoise-shell male, progeny and gametic constitution, 193.

Catalase activity and respiration in barley leaves, 26.

Catalysis and surface, 323.

Cataphoresis cell, new form, description, 327.

Catechol, isolation from pigmented onion scales, 533.

Caterpillars—see also Tent caterpillar.

tree-defoliating, fly parasites, 833.

urticant spines of, 389.

Catolaccus aeneoviridis, notes, Mo. 79.

Cattle—see also Calves, Cows, Heifers, Livestock, and Steers.

abortion-free herd, maintenance, Conn. Storrs 572.

Ayrshire, Advanced Registry records, analysis, U.S.D.A. 414.

baby beef—

feeding experiments, Oreg. 407.

meaning, 405.

beef—

and dual-purpose, body measurements, comparison, 405.

and dual-purpose, effect of experiments, U.S.D.A. 697.

composition of tissues, effect of long-continued muscular exercise, 700.

evaluation for register of merit, 405.

fattening, Ga. 248.

fattening, use of silage for, Kans. 248.

feeding experiments, Kans. 248.

in southern Louisiana, value of Brahman cross on, 405.

situation, Okla. 288.

wintering on straw and alfalfa hay, Oreg. 407.

blood, agglutinins in, effect of age, 426.

blood, sugar and hemoglobin in, Kans. 257.

Cattle—Continued.

- bones, structural changes in and effect of mineral deficient diet, 272.
- breeding—
 - diseases due to streptococci, Wis. 865.
 - effect of genetic studies, U.S.D.A. 705.
 - troubles, role of trichomonads, 713.
- carcasses, effects of management and sex, Mo. 564.
- Chinese, protozoan fauna of rumen, 275.
- dairy—*see also* Cows.
 - experiments in Virgin Islands, V.I. 572.
 - feeding experiments, Ind. 98.
 - feeding experiments with Sudan grass, U.S.D.A. 413.
 - feeding, two systems, Mass. 99.
 - growth in, Iowa 100.
 - rations not deficient in lime, Wis. 848.
 - studies, Calif. 97.
- disease affecting fore limbs, Ind. 104.
- diseases, *see specific diseases*.
- embryonic growth in, periods, 407.
- energy metabolism during lying and standing, Mo. 407.
- fattening rations, Ind. 89.
- feeding, winter, Ind. 841.
- fly sprays, methods of testing, 75.
- foot maggot, control, 826.
- grade Guernsey and grade Holsteins, inbreeding, U.S.D.A. 30.
- grub, northern, biology and control, 558.
- healthy and anemic, hemoglobin in blood, 413.
- Holstein, inheritance of markings in, 348.
- Holstein-Friesian, effects of inbreeding, Iowa 98.
- in respiration calorimeter, heat production, factors affecting, 414.
- no-lesion reactors, Wis. 865.
- of different market grades, fattening, 405.
- ovariotomy, effect, 407.
- parasites affecting, V.I. 585.
- plague, *see* Rinderpest.
- poisoning, *see* Livestock poisoning.
- Plants, poisonous, *and specific plants*.
- pregnancy in, relation to alcohol-milk test, Del. 98.
- purebred Ayrshire, inheritance of milk production and butterfat in, 348.
- ranch costs, establishing uniform units for, 444.
- range and semi-range, accrediting as tuberculosis-free, 275.
- range, minerals for, 405; N.Mex. 249.
- reproduction in, effect of low calcium ration, Minn. 258.
- sex ratio and multiple births in, 640.
- situation in the State, Okla. 737.

Cattle—Continued.

- tick—*see also* Ticks.
 - Australian, in Texas, 400.
 - life history, anatomy, and embryology, 697.
 - notes, 866.
- tuberculin-reaction, no-lesion, studies, 275.
- urine, acid-base balance, effect of rations, 699.
- vitamin requirements, 563.
- Cauliflower—
 - clubroot, control, Conn.State 221.
 - life history, 210.
- Cecal obstruction in the horse, yeast in treatment, 710.
- Cecidomyiidae attacking grass seed, 558.
- Cedar—
 - nuts, relation to Siberian nutcracker, 543.
 - red, leaf miner injury, Conn.State 546.
 - rust of apples, notes, N.J. 373.
- Celama corghiella*, *see* Sorghum webworm.
- Celery—
 - arsenical residues on, Conn.State 209.
 - blights, N.Y.Cornell 61.
 - diseases, control, 531; Fla. 221.
 - early blight, damage to 1933 crop, Mich. 532.
 - effect of rye and oat straws, 183.
 - Florida, grading, packing, and stowing, Fla. 50.
 - growth, effect of soils and fertilizers, 910.
 - home storage, materials for, Minn. 211.
 - Phoma* root rot, N.Y.Cornell 61.
 - premature seeding, N.Y.Cornell 50.
 - roots, *Bacterium tumefaciens* inoculation experiments, 62.
 - tarnished plant bug affecting, 77.
 - yellow-resistance varieties, Ohio 61.
- Cell, micro conductance, description and drawing, 488.
- Cells—*see also* Plant cells.
 - cytoplasmic structure, changes induced by virus diseases, 372.
 - living, treatment with coloring materials and reagents, 188.
 - multinucleate, electrical resistance, 188.
- Cellulose—
 - colloid chemistry, 323.
 - cotton, modification by swelling and by degradation, 315.
 - cotton, quantitative estimation, 476.
 - decomposition, effect of legume or non-legume crops, 502.
 - esters, 323.
 - fibers, behavior, refractive indices, 315.
 - linen, chemical degradation, 315.
- Cements and mortars, colloidal nature and properties, 323.
- Centipede, garden, control, 552; Calif. 87.
- Cephalobus* spp., notes, 228.
- Cephalogonimus species from ducks, 267.
- Cephonodes hylas*, description, 78.

- Cerambycidae, endemic, host trees in Hawaii, 385.
- Ceratitis capitata*, see Fruit fly, Mediterranean.
- Ceratostomella*—
- fimbriata*, effect of formaldehyde, 226.
 - ips*, cause of blue stain of pine trees in Japan, 680.
- Cercospora*—
- beticola* in pure culture, physiology and variations, 67.
 - spp., host range and intertransmissibility, Iowa 60.
- Cereal—
- crops, productive, for northern Wisconsin livestock farms, Wis. 791.
 - diseases, 526.
 - rusts—see also Rust and specific hosts.
 - control, 812.
 - dissemination, papers on, 372.
 - origin of physiologic forms, 63.
 - races, 372.
 - scab, studies, Ind. 60.
 - seeds, microphotography, 363.
 - stripe rust, relative susceptibility of cultivated and native hosts in Alberta, 666.
 - Synonym Committee, decisions, 201.
- Cereals—see also Grain and specific grains.
- accomplishments of station with, Alaska 36.
 - as forage crops, Wash. 790.
 - fertilizer and liming tests, Wis. 791.
 - vitamins in, 898.
- Cestodaria and Cestoda of Canadian animals, 425.
- Cestodes—
- infesting birds, 545.
 - occurrence in this country, 544.
- Chabertia ovina*, notes, 590.
- Chaetoxorista javanica*, parasite of oriental moth, 78.
- Chaff scale, notes, Tex. 384.
- Chaitophorus quercicola*, notes, 388.
- Chalcis minuta*, notes, 247.
- Chamaecyparis formosensis* heartwood rot, 824.
- Chamiza, growth and germination, N.Mex. 200.
- Charcoal—
- adsorbent, adsorption of electrolytes by, Mich. 488.
 - medicinal preparations, power of adsorption, 578.
 - use in swine feeding, 405.
- Chayote, vitamin A in, 617.
- Cheese—
- brick, methods of improving, Wis. 848.
 - Cheddar, alcohol-soluble proteins from, 418.
 - Cheddar, manufacture, standardization of milk for, Idaho 848.
 - cottage, making, improved methods, Wis. 848.
 - cottage, manufacture, S.C. 854.
 - cottage, properties, relation to dry skim milk, Mo. 574.
- Cheese—Continued.
- demand for, factors affecting, Wis. 881.
 - ripening studies, 263.
 - sour, causes and prevention, Wis. 848.
 - spreads, quality, Wis. 848.
 - tendency to early gassy fermentation, factors in, 419.
 - treatise, 419.
 - types, calcium and phosphorus in, Kans. 304.
- Cheilosporura hamulosa*, new intermediate host for, 268.
- Cheimatobia brumata*, notes, 72.
- Chelonus texanus*, notes, 398.
- Chemical—
- analysis, micro methods, 488.
 - discoveries, effect on use of fruits and vegetables, U.S.D.A. 652.
- Chemicals, toxicity to living organisms, effect of concentration, U.S.D.A. 380.
- Chemistry—
- applied, treatise, 747.
 - colloid, see Colloid chemistry.
 - comminution and colloid mills, 323.
 - of food and nutrition, trend of recent advances in, 890.
 - physiological, of plants, textbook, 25.
 - physiological, treatise, 142.
- Chenopodium aphid*, vector of bean mosaic virus, 387.
- Cherries—
- abnormal blossoms and fruits, Calif. 47.
 - cracking, Idaho 798.
 - early-ripening, embryogeny and embryo abortion in, 214.
 - Early Rivers and Emperor Francis, description, N.Y.State 367.
 - frozen, vitamin A in, 465.
 - pollen development, 799.
 - pollination, Calif. 47; W.Va. 212.
 - rootstock effects with, Vt. 805.
 - Royal Ann, harvesting for barreling, 523.
 - self-sterility in, 654.
 - sour, pollination experiments, 654.
 - sour, pruning, Wis. 798.
 - spray schedules for, Mo.Fruit, 654.
 - varieties, Ohio 49.
- Cherry—
- aphid, black, tar distillate sprays for, 236.
 - black knot, control, 537.
 - Black Orb, identified as old variety, 654.
 - blossoms and fruit, abnormality in, 655.
 - case bearer, and apple tissue decay in storage, 233.
 - case bearer, control, new developments, 830.
 - case bearer on apples, Wis. 825.
 - embryos, artificial culture, 214.
 - fruit flies, habits, 833.
 - fruit flies, host relations, 245.
 - fruits, double, occurrence and nature, Idaho 798.

Cherry—Continued.

leaf spot, control by Bordeaux mixture, Wis. 810.

trees, nursery, distinguishing characters, Mass. 652.

yellow leaf, control on nursery stock, 821.

Chestnut hybrids, Japanese-American, germination and growth, 679.

Chestnuts, Asiatic, survival following planting, N.Y.Cornell 57.

Chiasma frequency, studies, 194.

Chickens—*see also* Chicks, Fowls, Hens, Poultry, *and* Pullets.

broilers, cost of production, Mich. 97.

broilers, labor income and costs, Del. 126.

Chickpea, vitamin A in, 617.

Chicks—

battery brooding, protein requirements, N.H. 406, 569.

effect of wheat rations, Ind. 89.

embryonic mortality, effect of protein source in hens' diet, 703.

embryos, size and position, Calif. 88.

first feed, best age for, Minn. 256.

irradiation, 844.

January-hatched, less subject to coccidiosis and vices, Ohio 104.

labor income and costs, Del. 126.

leg disorders, types, 115; Ohio 115.

leg weakness in, Ind. 104.

leg weakness in, effect of New Orleans sunshine, 410.

malformation of bones, Kans. 249.

meat scrap and dried milk in rations, proportions, Ind. 89.

nutrient requirements, Nebr. 562.

raising, 704; Ohio 97.

salt tolerance, Md. 411.

sex determination in, Calif. 88.

slipped tendons, control, Iowa 89.

vitamin G requirements, N.Y.Cornell 90.

Child health and protection, White House conference on, 144.

Children—*see also* Girls *and* Infants.

effect on farmers' standard of living, Wis. 889.

health and weight, effect of certain factors, 305.

of retarded growth, basal metabolism, standards, 750.

of rural families, occupations, Conn. Storrs 888.

preschool, food habits and development, Ohio 143.

protein consumption and requirement, Ohio 616.

school, milk served to, fat consumption, 709.

Chilies—*see also* Peppers.

Indian, studies, 639.

Chilo—

oryzae and *C. simplex*, identity, 692.

simplex, *see* Rice borer, Asiatic.

zonellus, notes, 692.

Chimneys, domestic, deterioration, 287.

Chinese mantis, studies, 77.

Chionaspis furfura, *see* Scurfy scales.

Chloral hydrate as general anesthetic for fowls, 436.

Chlorates for weed control, 797; Calif. 37; Ind. 37; Kans. 200; N.Mex. 200.

Chlorides—

determination, 330.

in soils, electrometric determination, 12.

Chlorine—

and compounds, germicidal efficiency, 272.

as disinfectant, 106.

assimilation in sugarcane and other plants, Fla. 188.

effect on tobacco plant, 649.

sterilization of beekeeping equipment, Minn. 246.

Chloroform, effect on rate of photosynthesis in detached leaves, 507.

Chlorophyll—

and iron in green and chlorotic pear leaves, relation, 637.

determination, new method and instrument, 772.

effects in diet of rat, Ga. 464.

Chloropicrin as soil insecticide for wireworms, 84.

Chocolate ice cream, qualities, Mo. 576.

Cholam mite on sorghum, 399.

Cholesterol—

floridin activation, nature of, Iowa 3.

in normal women, 752.

of blood in dogs on vitamin A-deficient diet, 468.

Chondrodystrophy in fowl embryos, 196.

Chortophila cilicrura, *see* Seed-corn maggot.

Chromium in food and biological material, bibliography, 752.

Chromosome complex, somatic, 194.

Chromosomes—

in cotton and related genera, 190.

multiple pairing, hybridity, and fragments in roses, 347.

number in apple seedlings, N.Y.State 347.

number in corn, 639.

of fowls, 195.

somatic, number in sugarcane, 517.

Chrysanthemums—

improved varieties, breeding, Iowa 48.

photoperiod effects on blooming, N.Y. Cornell 57.

Chrysobothris femorata, *see* Apple tree borer, flat-headed.

Chrysoclista spp. infesting hawthorn, biology, 389.

Chrysocoma tenuifolia poisoning in Angora goats, 421.

Chrysomphalus—

aurantii, *see* Red scale, California.

dictyospermi, biology and control, 690.

Chrysopidae of Canada, 237.

- Chufas, dry lot feeding and grazing of pigs, Fla. 248.
- Church, rural, *see* Rural.
- Churns, micro-organisms in, Iowa 575.
- Churns, sanitation, Iowa 98.
- Cicadula divisa*, *see* Leafhopper, six-spotted.
- Cider filter, description, Mich. 3.
- Cigarette beetle, *see* Tobacco beetle.
- Cigars, hydrocyanic acid gas fumigation with sustained and dissipated vacuum, 75.
- Cirphis latuiscula*, control, Fla. 232.
- Cirphis unipuncta*, *see* Army worms.
- Cirrhosis of liver in horses, cause, 591.
- Citricola scale, predacious coccinellid on, 73.
- Citrus—*see also* Lemons, Oranges, *etc.*
- aphid, green, notes, Fla. 231.
 - cambium miner, new, from Puerto Rico, 72.
 - culture, Fla. 209; Hawaii 652.
 - diseases, studies, Fla. 221.
 - fertilizers and rootstocks for, Calif. 47.
 - fruit diseases, storage and transportation, 676.
 - fruit juices, quality, factors affecting, 57.
 - fruit rots, role of potash fertilization against, 676.
 - fruits, cold storage, Fla. 209.
 - fruits, decay in storage, Fla. 221.
 - fruits, Florida, preservation, 891.
 - fruits, glucosides of, Fla. 303.
 - fruits, preservation, 538.
 - fumigation, interval shooting, value, 75.
 - insects, control, Tex. 384.
 - insects, control in many parts of world, 550.
 - insects in Brazil, 550.
 - insects of tropical Asia, U.S.D.A. 550.
 - juices and pulps, preservation, Fla. 209.
 - landscape and windbreak tests, Fla. 209.
 - nucellar bud seedlings, neophytosis of rejuvenescence, 56.
 - orchard management, Tex. 369.
 - red scale affecting, laurel-sumac as source, 77.
 - scab from herbarium specimens, records, 821.
 - seeds, germination, effect of soil temperature, 660.
 - thrips in southern California, 387.
 - trees, absorption of ash constituents, P.R. 49.
 - trees, control of time of blooming, P.R. 49.
 - trees, effect of potash, Fla. 209.
 - trees, fertilizer experiments, Fla. 209.
 - varieties, new, tests, U.S.D.A. 651.
 - water spot and water rot, notes, 540.
 - whitefly, *see* Whitefly, citrus.
- Cladosporium*—
- cyclaminis* n.sp., notes, N.Y.Cornell 61.
 - fulvum*, control, 226.
- Clay, structure, relation to foundation engineering, 118.
- Clays, cohesion and viscosity, 336.
- Clemson College, notes, 480.
- Climate—*see also* Meteorology.
- and corn yield in Indiana, 1887–1930, 178.
 - effect on German grains, 178.
 - of Lower Rio Grande Valley of Texas, U.S.D.A. 177.
 - of Maryland and Delaware, 177.
- Climates—
- classification, critical review, 13.
 - of the earth, 634.
- Climatic factors, technic and methods in study, 547.
- Climatological data, U.S.D.A. 634.
- Clitocybe* mushroom root rot of woody plants, Fla. 221.
- Clostridium*—
- acetobutylicum*, formation of methylglyoxal by, 166.
 - acetobutylicum*, notes, P.R. 771.
 - chauvoei*, heat-stable antigen, value as immunizing agent, 423.
 - chauvoei*, studies, 711.
 - oedematoides* and *Bacillus sordellii*, identity, 270.
 - welchii* strain causing fatal dysentery in lambs, 859.
- Clothes moth—
- case-bearing, susceptibility of animal and vegetable fibers to, 79.
 - unusual invasion, 391.
 - webbing, biology and control, N.Y.Cornell 72.
 - webbing, duration of Eulan protection against, 391, 833.
 - webbing, Eulan Neu tests for, 391, 833.
 - webbing, naphthalene for, 237.
 - webbing, susceptibility of animal and vegetable fibers to, 79.
- Clothes moths—
- and carpet beetles, N.J. 242.
 - and house moths, life history, habits, and control, 391.
 - fish meal as food for, 692.
- Clothing construction, Ill. 765.
- Clothing, textbook, 303.
- Clover—
- alfalfa, and timothy mixture on meadows, tests, Ohio 38.
 - culture, effect on soil biochemical processes, 183.
 - diseases, control methods, 222.
 - effect of nurse crop, 644.
 - hay proteins, nutritive value, N.Y. Cornell 90.
 - hay rich in hybrid clover, effect on liver in horses, 591.
 - Ladino, breeding, Idaho 788.
 - leaf weevil, notes, Kans. 232.
 - mildew, studies, Ind. 60.
 - nodule organism, deficiency on Welsh soils, 644.

Clover—Continued.

- powdery mildew, notes, Idaho 810.
- red—
 - adaptation studies, Ind. 37.
 - breeding, Idaho 788; Ind. 37.
 - fertilizer requirements, R.I. 200.
 - for seed production, fertilizer experiments, 644.
 - hybridization in, 192.
 - seed production in Intermountain States, U.S.D.A. 40.
 - survival in soil treated with sodium chlorate, 356.
 - variety tests, Iowa 37; Kans. 200; Mass. 643.
- seed, drilling lime with, Ohio 38.
- seed midge, control, 393.
- sweet, *see* Sweetclover.
- variety tests, Wyo. 791.
- white, vitamin A in, 412.
- white, yield and composition for bottom land, 354.
- wild white, distribution, relation to earthworm activity, 644.
- worm, green, attacking beans, 548.

Onidocampa flavescens, *see* Oriental moth.

Coal—

- dust engine, ignition and combustion process, 285.
- slacked, use in swine feeding, 405.
- tar and kerosene emulsion, use as insecticide, 825.
- tar creosote, toxic action, 665.

Cobalt—

- in animal nutrition, 753.
- in food and biological material, bibliography, 752.
- polycythemia in rats, studies, 754.

Coccidae—

- of western basin of Mediterranean, 239.
- parasites in Hawaii, 385.

Coccidia—

- in peacocks, 545.
- of rodents and domestic animals, cross infection experiments, 268.

Oocidioides immitis in lesions of slaughtered animals, 269.

Coccidiosis—

- bovine, studies, 267, 586.
- canine, due to *Eimeria canis*, 277.
- control, N.H. 420.
- in fowls in Russia, 594.
- in fowls, litter treatment, 267, 278, 279.
- in hares, 719.
- in swine, colloidal iodine in, 110.
- studies, 267, 594; Nebr. 578.

Coccinellidae, West Indian, new genus, 695.

Cocomyces—

- hiemalis*, control on nursery stock, 821.
- prunophorae*, notes, 537.

Coccus pseudomagnoliarum, *see* Citricola scale.

Cocks, secondary sex characters, effect of X-ray treatment of testes, 35.

Cocksfoot—

- germination, effect of chemicals, 782.
- glyceride fatty acids from, 487.
- Coconut leaf miner, fungus disease of, 832.
- Coconuts, fertilizer experiments, P.R. 798.
- Cocoons, tyrosine in, 4.
- Codling moth—
 - biology and use of treated bands for, Ohio 72.
 - bionomics and control, Del. 71.
 - control, 385; Ind. 48, 831; Mo. 78; N.Y.State 691.
 - control, adapting northwest methods to midwest conditions, 385.
 - control by arsenicals, tests, 385.
 - control, chemically treated bands for, 241.
 - control, determining results, 831.
 - control, developments in, 386.
 - control in Michigan, 547.
 - control in Northwest, 545.
 - control in Queensland, 831.
 - control in South Africa, 557.
 - control information, gain during last decade, 241.
 - control, spraying for, Pa. 389.
 - control, success and failure in, Mich. 212.
 - control, test of tar distillate sprays for, 237.
 - control, use of oil in, Idaho 824.
 - control with late summer oil, 241.
 - development on leaves alone, 831.
 - in New York, 240.
 - in Santa Clara Valley, larval parasites, 691.
 - in southeastern Nebraska, brood study, Nebr. 547.
 - in southern Kansas, spray tests, Kans. 240.
 - in southwestern Michigan, spray tests, 240.
 - larvae, entrance into fruit, 831.
 - notes, Ind. 71.
 - sprays and baits, N.Mex. 232.
 - studies, Kans. 232.
 - toxicological studies, technic, 240.
- Cod-liver oil—
 - and milk, supplements for substandard workers, 150.
 - and ultraviolet rays, effect on growing organism, 703.
 - as source of vitamin D for chicks, Wash. 845.
 - effect on sheep on calcium deficient ration, 564.
 - emulsions, vitamin A in, 759.
 - for laying pullets, Ky. 704.
 - inhibitor of antimony trichloride test for vitamin A in, 773.
 - test for reduction of lost time in industry, 149.
 - treatment with charcoal, effect, Ind. 150.
 - vitamin A in, 630.
 - vitamin D concentrate from, use, 154.

- Coeloides scolyticida*, notes, 245.
- Coffee—
 bean oil, unsaponifiable matter, 167.
 black tip, notes, 526.
 borer, chalcid parasite in Indochina, 561.
 clear wing hawk moth, description, 78.
 culture experiments, Hawaii 652.
 culture in Ecuador, 624.
 die-back, notes, 373.
 diseases, parasitic, in the Orient, 822.
 fertilizer experiments, Hawaii 652; P.R. 798.
 in Kona district, Hawaii 806.
 leaf rust, notes, 526.
 mealybug control, banding for, 555.
 nematode diseases, 228.
 plantations, old, rejuvenation, Hawaii 652.
 shading experiments, P.R. 49.
 vegetative propagation, P.R. 49.
- Cohesion and adhesion, 323.
- Colaspis brunnea*, see Grape colaspis.
- Cold storage holdings, U.S.D.A. 612.
- Colds, disabling, tests of cod-liver oil for, 149.
- Coleophora*—
caryaefoliella, see Pecan cigar case bearer.
pruniella, see Cherry case bearer.
- Colitis in pigs, Ind. 104.
- Collagen digestion by enzyme from blowfly larvae, 559.
- Colleges, see Agricultural colleges.
- Collembola of Australia, systematic account, 237.
- Colletotrichum*—
atramentarium, notes, 533.
lagenarium on Cucurbitaceae, biology and control, Iowa 60.
lindemuthianum on beans in shipment, 812.
lindemuthianum races, physiology, N.Y.Cornell, 61.
 sp., notes, 526.
- Colloid chemistry, technological applications, papers on, 323.
- Colloidal carbon, value against mastitis, 108.
- Colloids of soil, papers on, 323.
- Colloids, X-ray researches on, 323.
- Colonization Finance Corporation of Canada, farm management program, 604.
- Color—
 inheritance in cotton plant, 639.
 inheritance in seed coat of *Phaseolus lunatus*, 784.
 inheritance in sweetpotatoes, Ga.Coastal Plain 37.
 mutation, leaden, in mice, 787.
 of body and eye in rabbits, genetic relation, 509.
- Colorado College, notes, 319, 478, 910.
- Colorado Station, notes, 159, 478, 767, 910.
- Colorimeter—
 disk, construction and operation, 655.
- Colorimeter—Continued.
 new and simplified, for estimation of manganese, 330.
- Colts, draft—
 feeding, 405.
 roughages for, preparation, Iowa 89.
 wintering, Mich. 568.
- Columbine—
 borer, notes, N.Y.Cornell 72.
 vicinism in, 216.
- Combines—
 depreciation in western Canada, 286.
 requirements for Corn Belt conditions, 439.
 studies, Ind. 116.
 survey in Georgia, 599.
- Communities, rural New England, decadence and growth, 139.
- Community, Mohammedan, in India, culture patterns, relation to social processes in, 301.
- Concrete—
 exposed to sulfate waters, tests, U.S.D.A. 725.
 reinforced, construction, principles, treatise, 283.
 subfloors, when to lay wood floors over, 120.
- Cone-nose bug, *Trypanosoma cruzi* from intestine, 425.
- Confectionery manufacture, applied colloidal chemistry in, 323.
- Conifer plantations, effect of mycorrhiza, 343.
- Coniferous seedlings, diseases, Ohio 61.
- Conifers—
 cultivated, in North America, monograph, 525.
Phomopsis spp. on, differentiation, 379.
- Coniophora cerebella*—
 and *Merulius lacrymans* in mixed cultures, biology, 680.
 in timber of buildings, development, effect of fillers, 680.
- Connecticut—
 State College, notes, 159, 767.
 State Station, report, 157, 317.
 Storrs Station, notes, 767.
 Storrs Station, report, 157, 621, 909.
- Conotrachelus nemuphar*, see Plum curculio.
- Conservation program, human element in, Mo. 601.
- Contarinia*—
dactylidis attacking grass seed, 558.
lolii n.sp. attacking grass seed, 558.
pisi, studies, 549.
- Convallaria majalis*, new species of *Urocystis* on, 69.
- Cookbook, national, treatise, 892.
- Cookery, electrical, Me. 477.
- Cooking equipment for farm homes, comparison, Kans. 317.
- Cooperation, see Agricultural cooperation and Marketing.

Cooperative—

- associations, membership and value of products, Md. 736.
- societies, producers' and consumers', relations in England and Wales, 737.

Cooperia—

- curticei* in sheep of New South Wales, 580.
- spp., notes, 590.

Cooperioides kenyensis n.g. and n.sp., description, 590.

Copper—

- and iron supplements in exclusive milk diet for calves, Ohio 99.
- effect on iron assimilation by rat tissues, 616.
- fungicides, studies, 664.
- in fish, 752.
- in food and biological material, bibliography, 148.
- in liver and liver extracts, 463.
- in milk and milk preparations, 463.
- reduction values of mannose, 174.
- residues on cranberry vines, effect, Mass. 663.
- spray, colloidal home-made, Me. 373.
- sulfate, effect on growth of *Piricularia oryzae*, 66.
- sulfate, efficiency against stomach worms, 717.
- value in regeneration of hemoglobin in anemic lambs, 406.

Copper-iron-salt mixture for cattle and swine, Fla. 248.

Coprinus disseminatus, studies, 372.Coprophagy as source of vitamin B (B₁), 469.

Coralberry root rot, notes, U.S.D.A. and Tex. 528.

Corn—

- acre values, Minn. 201.
- and hog ratio in the State, Okla. 737.
- and soybean ration for hogs, improvement, Ind. 89.
- and soybeans for silage, N.Y.Cornell 202.
- and soybeans, interplanting, Ohio 39.
- anomaly in, inheritance, 344.
- anticalcifying factor in, development and destruction, Wis. 890.
- antirachitic properties, 755.
- as green manure, Ohio 17.
- bacterial wilt, notes, U.S.D.A. 669; Wis. 810.

borer, European—

- abundance, ecological aspects, 832.
- control, Conn.State 231, 546.
- control, corn breeding experiments for, 556.
- control with farm machinery, Pa. 440.
- eggs, laboratory production, 78.
- enforcing compulsory clean-up regulations for, 692.
- in Netherland East Indies, 241.
- insecticides used against, 832.

Corn—Continued.

borer, European—continued.

- notes, Ind. 71; Ohio 72.
- parasite of, biology, 697.
- propylene dichloride fumigation for, 832.
- situation in 1932, 78.
- situation in Ontario in 1931, 548.
- breeding, Fla. 199; Ga.Coastal Plain 37; Kans. 200; N.Y.Cornell 38; Nebr. 512; P.R. 39; V.I. 512.
- breeding for borer control, 556; Mich. 513.
- canning, diseases, Minn. 529.
- cash price, movements in, Iowa 127.
- chromosome numbers in, 639.
- cover crops for, Ga.Coastal Plain 37.
- cultivation, Ohio 513.
- culture experiments, Fla. 199; Kans. 200; Nebr. 512.
- culture under irrigation, Wash. 356.
- cutting, low, Ind. 116.
- delayed planting, remedy for, Ohio 794.
- diseases, Fla. 221.
- diseases, control methods, 222.
- diseases, resistance to and control, Kans. 222.
- dry-land production, Nebr. 790.
- dry lot feeding and grazing of pigs, Fla. 248.
- ear v. shelled, for pigs, Ohio 90.
- ear worm, insect enemies, 242.
- ear worm moth, egg-laying habits and fate of eggs, Va. 829.
- ear worm moth, response to sugar solutions, 80.
- ear worm, notes, Kans. 232.
- effect of high temperature on polyploidy and other variations, N.Y. Cornell 40.
- elasticity of supply, Iowa 126.
- feeding method for fattening lambs, Iowa 565.
- feeding value compared with other grains, 840.
- fertilizer experiments, Calif. 37; Fla. 199; Ga. 199; Ga.Coastal Plain 37; Nebr. 512.
- for fattening calves, Nebr. 562.
- for hogs, U.S.D.A. 839.
- for sheep, U.S.D.A. 839.
- for silage, variety tests, Ill. 840; R.I. 200.
- germination after years of storage, 363.
- grinding, for swine, degree of fineness, 405.
- ground, v. ground wheat for dairy cows, Kans. 257.
- hogging-off, La. 408.
- husking cost in 1931, Ind. 126.
- hybrids, U.S.D.A. 644.
- hybrids and varieties, comparisons, Ohio 38.
- hybrids, breeding and yield, Wis. 791.
- in world commerce, monograph, 743.
- inbred lines, studies, Iowa 38.

Corn—Continued.

- industry, future, of Union of South Africa, 450.
- infection with *Physoderma zeae-maydis*, 223.
- insects affecting, Kans. 232.
- Iowa's commercial, destination and origin, Iowa 126.
- kernel, development, relation to seed value, Iowa 38.
- leaf aphid on sorghums, Kans. 232.
- linkage relations of a second brown midrib gene, 29.
- maturing, relation to June temperature, U.S.D.A. 333.
- meal, degermed cooked, value for pigs, 567.
- meal, yellow, as source of vitamin A, N.H. 406.
- nitrogenous fertilizer tests as aid in borer control, Ind. 37.
- partially sterile type, characterized by lack of cytokinesis, 783.
- picker-harvesters, notes, Iowa 116.
- picker losses, Ind. 116.
- pickers, mechanical, studies, 732.
- pickers, profitableness of use, Iowa 127.
- plant as ground fodder for sheep, N.Mex. 249.
- plant characteristics, effect on mechanical corn picker loss, 732.
- plant, phosphorus transformations in, 40.
- planters, Ohio 116.
- planting rate for grain, Mich. 513.
- plants, anchorage, factors affecting, Va. 41.
- plants, daily growth, 505.
- prices within Iowa, variations in, Iowa 740.
- production, mechanical, Ind. 116.
- production methods, Iowa 116.
- proteins, biological values, 896.
- research, Iowa 38.
- resistance to insect injury, Kans. 232.
- rotation and tillage experiments, U.S.D.A. 789.
- rotation experiments, U.S.D.A. 789.
- sap, composition, relation to soil solution, 19.
- sap, phosphorus in, as measure of available soil phosphorus, 20.
- seed, germination, relation to molds, S.Dak. 532.
- seed, induction of mutations by heating, Fla. 199.
- seed treatments, Kans. 200.
- shelled, for swine, protein supplements to, Ga. 248.
- silage, *see* Silage.
- smut, notes, N.J. 373.
- smut resistant strains, Iowa 60.
- starch, fatty acids associated with, 167.
- storage, Ohio 116.
- sweet, *see* Sweet corn.
- types for fattening pigs, Iowa 89.

Corn—Continued.

- types of pinking in, 814.
- variability of characters in, Ohio 38.
- varieties and hybrids, tests, P.R. 39.
- varieties on peat land, Minn. 201.
- variety tests, Fla. 199; Ga.Coastal Plain 37; Hawaii 643; Kans. 200; N.Mex. 200; Nebr. 512; Pa. 794; U.S.D.A. 789.
- yellow, vitamin A and carotene in, 898.
- yield and climate in Indiana, 1887-1930, 178.
- yield, effect of seed-bed preparation, Ohio 116.
- Corncob meal, decomposition, relation to fungi, Iowa 28.
- Corncribs for the Corn Belt, designs, U.S.D.A. 600.
- Cornstalk borers, Iowa 71.
- Cornstalk disease, notes, Kans. 265.
- Cornstalks—
 - carbohydrate constituents, identification, Iowa 3.
 - insulating board from, manufacture, 120.
- Corpora lutea from cows, vitamin A in, Ohio 99.
- Corporin, purification, 198.
- Corticium solani*, notes, 533.
- Corticium* sp., notes, 373.
- Cortico-adrenal extract, induction of precocious sexual maturity by, 197.
- Corynebacterium equi*, notes, Ky. 111.
- Coryza in fowls, etiology, 279.
- Cotton—
 - acreage and yield, 1866-1931, revised estimates, U.S.D.A. 744.
 - and jute as bale covering materials, comparison, U.S.D.A. 514.
 - angular leaf-spot disease in Uganda, 814.
 - boll, fiber abnormalities and pressure variations in, 357.
 - breeding, Fla. 199; N.Mex. 200.
 - breeding varieties adapted to mechanical harvesting, 514.
 - budding and grafting trials, U.S.D.A. 645.
 - centers, one-variety, development, Ga. 199.
 - chromosomes in, 190.
 - clinging power and number of convolutions, 906.
 - community production, effect on yield and staple length, S.C. 358.
 - cover crops for, Ga.Coastal Plain 37.
 - culture experiments, Fla. 199; Ga. Coastal Plain 37.
 - culture in Ecuador, 624.
 - culture in San Joaquin Valley, U.S.D.A. 204.
 - cytological studies, 638.
 - date-of-planting tests, Okla. 356.
 - diseases, monograph, 374.
 - effect of different doses of nitrogen, 792.
 - effect of fertilizers, 792.

Cotton—Continued.

- Egyptian, effects of topping, 204.
- fabrics, strength and color, factors affecting, Tex. 316.
- farmers, social life among, Okla. 614.
- female gametophyte and embryo in, development, 357.
- fertilizer experiments, Fla. 199; Ga. 199; Ga.Coastal Plain 37; N.Mex. 200; P.R. 790; Tex. 43.
- fertilizers, mechanical application, U.S. D.A. 359.
- fruiting, physiological factors affecting, Ariz. 42.
- genetic studies, 344, 783; N.Mex. 200.
- ginning, studies, 439.
- goods, mildew in, fungi causing, 374.
- grade and staple length, relation to farm prices, Ga. 605.
- harvesters, notes, Calif. 116.
- in San Joaquin Valley, root development, U.S.D.A. 357.
- industry and trade in China, 606.
- industry, antiseptic against mold fungi in, 374.
- industry, developments, U.S.D.A. 645.
- infection by *Bacterium malvacearum* in control chambers, 372.
- inheritance of virescent colors, 639.
- insect investigations, reliability of differences in data, 76.
- insects affecting in Uganda, 549.
- leaves, development and shedding, 794.
- marketing, Ga. 295.
- marketing, cooperative, status, 444.
- natural crossing in, 344.
- North Carolina, home market for, N.C. 455.
- Oklahoma, grade, staple length, and tenderability, Okla. 737.
- pests in Callide Valley, 234.
- producers, competitive position, Okla. 288.
- production and acreage adjustments in South, factors affecting, U.S.D.A. 132.
- production machinery, field plot experiments, 879.
- ripening, 315.
- root rot—
 - conference, report, Tex. 532.
 - effect of date of planting, Tex. 532.
 - fungus, sclerotia-forming habits in Texas, 669.
 - persistent strands in Texas, 814.
- roots, behavior in deep soil, 188.
- sea island, culture in Puerto Rico, P.R. 646.
- sedge, analyses, Alaska 36.
- seed, *see* Cottonseed.
- soreshin, nematodes associated with, U.S.D.A. 670.
- sorter, new type, 286.
- spacing experiments, Okla. 356.
- spinning tests, U.S.D.A. 906.

Cotton—Continued.

- stem cuttings, callusing and rooting, Tex. 504.
 - uses, bibliography, U.S.D.A. 620.
 - value of cover crops for, Calif. 37.
 - variation of characters, relation to position of seeds in lock, 41.
 - varietal studies, 792.
 - varieties, yield, factors affecting, 646.
 - variety tests, Fla. 199; Ga.Coastal Plain 37; N.C. 203; N.Mex. 200; Okla. 356.
 - variety-time-of-planting tests, Ga. 199.
 - water requirements and economical use, N.Mex. 282.
 - wilt disease, variation in, 792.
 - wilt in Egypt, 65.
 - workers of British Empire, conference proceedings, 43.
 - yield, relation to size and shape of plant, 358.
- Cottonseed—
- anatomy and microchemistry, 203.
 - cake, feeding value, Wyo. 92.
 - composition and weight, effect of potash, Miss. 514.
 - delinting with sulfuric acid, 646.
 - germination, factors in, Ga. 199.
 - meal v. fish meal for dairy cows, Md. 572.
 - products for fattening calves, 405.
- Cottony-cushion scale—
- notes, Tex. 384.
 - population study of biological control, 233.
- Cotyledon orbiculata* toxicity, determination, 421.
- Council of Agriculture for England, proceedings, 449.
- Country, *see* Rural.
- Cover crops—
- effect on tobacco, Conn.State 519.
 - use, N.Y.Cornell 50.
 - variety tests, Alaska 36; Fla. 199.
 - winter, for cotton and corn, Ga.Coastal Plain 37.
- Cowpeas—
- fertilizer experiments, Ga. 199.
 - variety-date-of-planting tests, Fla. 199.
 - variety tests, Ga.Coastal Plain 37; N. Mex. 200; V.I. 512.
- Cows—*see also* Calves, Cattle, and Heifers.
- beef, maintenance for calf production, Mont. 842.
 - dairy, minimum protein for, N.Y. Cornell 99.
 - dairy, nutritive requirements, 406.
 - dairy, seasonal effect on yield, 849.
 - diseases and sanitary regulatory measures, 426.
 - drying off, comparison of methods, 850.
 - effect of arsenical dipping on milk yield, 258.
 - effect of fly sprays, Calif. 97.
 - feed energy, transformation into milk energy, 413.

Cows—Continued.

feeding on alfalfa hay alone, U.S.D.A. 848.

Galloway-Holstein, feeding and breeding, Alaska 88.

grinding grains for, value, Ind. 849.

lactating, on rations of varying fat content, blood sugar, 849.

loose pens for, effect on labor and cost for bedding, Mass. 737.

milk production, *see* Milk production.

records, *see* Dairy herd records.

suffering from fluorosis, plasma phosphatase in, 414.

udders, *see* Udders.

Crab apples, American species and varieties, N.Y.State 367.

Crabgrass control by shading, Ohio 38.

Crabs, vitamin A in, 150.

Cracca virginiana roots, rotenone and related compounds in, 551.

Crackers, autoxidation of shortenings in and keeping quality, Minn. 167.

Cranberries—

bog irrigation, pollination, and varieties, Mass. 652.

composition, Mass. 652.

injury, relation to oxygen in flooding water, Mass. 663.

insects affecting, Mass. 687.

nutritive value, 142.

spraying experiments and storage, Mass. 663.

studies, Mass. 747.

vitamin C in, 890.

Cranberry—

bogs, June flooding for, Mass. 687.

false blossom—

bogs, regeneration, Mass. 663.

control, N.J. 377.

inoculation experiments, 378.

resistant strains, development, Mass. 663.

fruit worm, effect of nicotine sulfate, Mass. 687.

industry, value of birds to, 543.

plants, respiration, relation to water injury, 343.

root grub, control, Mass. 687.

spittle insect, control, Mass. 687.

vines, growth, effect of Bordeaux spray residue, Mass. 663.

Crane flies of northern Florida, ecological distribution, 558.

Crane fly larvae, control, 393.

Cream—

cooling at buying station and keeping it cool in transit, Ind. 853.

fat globules, substances adsorbed on, relation to churning, 853.

grading on four day delivery plan, Ind. 138.

homogenization, Pa. 851.

pasteurized, methods of cooling, effect, Calif. 97.

separators, effect of variations in speed on fat test, Calif. 97.

Cream—Continued.

sweet and sour farm-skimmed, enzymes in, Ind. 98.

tallowiness in, biological factors, Ill. 417.

viscosity, factors affecting, 852.

whipping ability, seasonal variation, Wis. 848.

whipping properties, effect of freezing and thawing, 706.

Creamery license division, report, Ind. 104.

Credit Company, International Agricultural Mortgage, scope and organization, 604.

Creeping Jennie, spread and control, Iowa 38.

Cremastus minor, parasite of oriental fruit moth, Mich. 561.

Crematogaster lineolata n.sp., description, 388.

Crenosoma vulpis, mechanical removal from foxes, 105.

Crepis, genetics studies, Calif. 48.

Cricket, Mormon, notes, Mont. 232.

Cronartium ribicola, *see* White pine blister rust.

Crop—

plants, registration, ecotype concept in, 637.

reports, U.S.D.A. 139, 296, 458, 612, 744.

returns, effect of farm practices, Mich. 130.

rotations, *see* Rotation of crops.

yields, effect of climatic factors, 14.

yields, effect of organic matter, 182.

Crops—*see also* Field crops, Forage crops, Root crops, and specific kinds.

acre yields and digestible nutrients, Minn. 201.

composition, Iowa 16.

dry-land, pasturing by hogs, U.S.D.A. 839.

dry-land, studies, Nebr. 789; U.S.D.A. 789.

effects on succeeding crops, R.I. 178.

fertilizer requirements, R.I. 178.

hail damage, basis of estimation, 775.

irrigated, pasturing by hogs and sheep, U.S.D.A. 839.

magnesium requirements, Mass. 643.

production, labor and power used in, Ind. 881.

production on Newlands project, Nev. 612.

relative yield and dependability under High Plains conditions, Okla. Panhandle 790.

row, seed bed preparation, Kans. 201.

selected production, farmers' response to price relations, 442.

soiling, Oreg. 354.

Crotalaria—

as forage crop and hay for rabbits and cattle, Fla. 248.

for hay, variety tests, Fla. 199.

Crotalaria—Continued.

seed, toxicity and palatability for poultry and quail, Fla. 248.

variety tests, Ga.Coastal Plain 37.

Crotalariosis in sheep, 421.

Crown gall—

and wound callus on apple, histological study, 674.

hairy-root, and radiobacter organisms, Wis. 810.

on a conifer, 678.

Crows, faunae of nests in Montana, 382.

Crucifer diseases in Florida, 223.

Crucifers, biologic forms of *Albugo candida*, 61.

Crude fiber, *see* Cellulose.

Cryolite, synthetic, for Mexican bean beetle control, 84.

Crypticus obsoletus, new strawberry pest, 824.

Cryptococcus fagi, *see* Beech scale.

Cryptolaemus montrouzieri—

introduction and study, Fla. 231.

parasite of citrus mealybug, 829.

Cryptorchidism, economic importance to producer of swine, 590.

Crystals and molecules, classification, 323.

Cubé root, rotenone content, 234.

Cubé tests, V.I. 520.

Cucumber—

beetles—

control, Fla. 232.

notes, Ind. 71.

striped and spotted, insecticides for, N.Y.Cornell 72.

diseases, Me. 373.

downy mildew, notes, Mass. 663.

extracts, antiscorbutic action, 8.

mildew, control, P.R. 810.

mosaic, menace to tobacco, Wis. 810.

mosaic, transmission to spinach, 671.

Cucumbers—

culture in electrically heated soil, Calif. 51.

culture with artificial light, 124.

Florida, grading, packing, and stowing, Fla. 50.

spraying and dusting, N.Y.Cornell 61.

Cucurbit diseases, control, Ga. 668.

Cucurbitaceae, cytological and phylogenetic studies, 638.

Cucurbits, breeding, Iowa 48.

Culex mosquitoes, effect of paris green diluted with charcoal, 393.

Culex pipiens, biology and histophysiology, 833.

Culture media used for *Ophiobolus miyabeanus*, effect on another fungus, 25.

Curculio caryae, *see* Pecan weevil.

Currant leaf marginal disease, potassium sulfate for, 69.

Currant worm, imported, Conn.State 546.

Currants—

black, named seedlings, description, 799.

black, root growth under different fertility conditions, 654.

Current meters, rating and use, Colo. 871.

Cutworm—

black, control, Fla. 232.

black, larval instars and feeding, 391.

granulate, control, Fla. 232.

species, parasite of, mass rearing, 234.

variegated, notes, Kans. 232.

Cutworms, outlook in 1933, Mont. 232.

Cyanamide—

as orchard fertilizer, Ohio 49.

as source of nitrogen for sugarcane, La. 648.

Cyclamen mite as strawberry pest, 548.

Cyclohexane, oxidation, 730.

Cyclohexene, oxidation, 730.

Cycloneda sanguinea parasite, new to Puerto Rico, 73.

Cydnidae of Cuba, 387.

Cylas formicarius, *see* Sweetpotato weevil.

Cylicostomes, n-butylidene chloride for, 106.

Cypress, American, uses, 218.

Cypress scale, honeydew from, 555.

Cyrtogaster dineutes, life history, 697.

Cysteine, new color test for, 12.

Cysteine, o-quinone test for, 632.

Cysticercus—

fasciolaris in rats, protection, 426.

ovis, notes, 268.

Cystine—

action of sulfite on, 165.

content of glutelins, 165.

effect of alkalies on, 483.

effect on kidney, relation to vitamin B complex, 152.

metabolism, 145.

Cytochrome and yeast iron, 632.

Dahlia mosaic—

and related diseases, 677.

relation to stunt, 823.

Dahlias, value of muslin coverings, N.Y.Cornell 57.

Dairy—

and wheat situation, Okla. 288.

barns in Quebec, ventilation, 600.

business, studies, N.C. 882.

byproducts as hog feed, Nebr. 562.

cattle and dairy cows, *see* Cattle and Cows.

cleaners, properties, 708.

Day, Ohio, fifth, program for, Ohio 302.

farm incomes, Wis. 881.

farm rotation on neglected hay lands, N.H. 353.

farming in New York, N.Y.Cornell 454.

farms, labor requirements, effect of re-planning equipment, Mass. 737.

farms, mechanical refrigeration for, Ind. 125.

herd improvement, Kans. 257.

herd records, value, U.S.D.A. 705.

herds, breeding efficiency, Idaho 848.

industry of Union of South Africa, 450.

- Dairy—Continued.
 management, labor income, N.Y.Cornell 127.
 manufacturing machinery, treatise, 123.
 production costs, effect of feed crops and pastures, U.S.D.A. 705.
 products—
 export and import trade of United States in, Mich. 457.
 nutritive value, U.S.D.A. 705.
 organisms important in, classification, Iowa 98.
 quality, factors affecting, U.S.D.A. 705.
 sires, *see* Bulls and Sires.
 Dairying—*see also* Creamery, Butter, Milk, etc.
 papers on, U.S.D.A. 705.
 Dams, earth, water movement through, 118.
 Darwinism, recent revivals, 344.
 Dasheens, fertilizer experiments, P.R. 39.
Dasyneura—
 alopecuri on meadow foxtail, 558.
 dactylidis n.sp. attacking grass seed, 558.
 leguminicola, *see* Clover seed midge.
Datana integerrima, *see* Walnut caterpillar.
 Dates, decline disease, Calif. 60.
Davainea proglottina, life history, 544.
 Death camas, species in Wyoming, Wyo. 422.
 Debts in United States, N.Y.Cornell 127.
Decadionus—
 n.g. and n.spp., descriptions, 695.
 pictus larva, description, 695.
 Delaware Station, notes, 159, 910.
 Delaware Station, report, 157.
 Delphinium new virus disease in Idaho, U.S.D.A. 677.
 Delphiniums, history and cultivation, treatise, 216.
Dendroctonus—
 brevicomis, *see* Pine beetle, western.
 frontalis, *see* Pine beetle, southern.
 simplex, *see* Larch beetle, eastern.
 valens, *see* Turpentine beetle, red.
Dendrolimus pini, normal food, 233.
 Deodar cedar, ecology and timber production, 218.
 Department of Agriculture, *see* United States Department of Agriculture.
 Depression, general, technical improvement in agriculture as cause, 737.
Dermacentor—
 halli from the Texas peccary, 267.
 variabilis, *see* Dog tick, American.
 Dermatitis—
 in rats, relation to human pellagra, 148.
 in rats, relation to vitamin G, Mo. 152.
 infectious labial, of sheep, cross-immunity tests, 580.
 necrotic, of equines, 592.
 vesicular, in man, beetle as source, 695.
Dermestes vulpinus, *see* Hide beetle.
 Dermestid larvae, control in dwelling houses, N.Y.Cornell 72.
 Derris—
 kerosene extracts, insecticidal efficiency, 824.
 root, rotenone content, 234.
 roots, analysis and estimation of rotenone in, 383.
 tests, V.I. 520.
 Desert—
 plants, relation to caliche, 180.
 rainfall, 14.
Desmoris fulvus parasites, 696.
 Detergents, paper on, 324.
Deuterophoma tracheiphila, notes, 372, 540.
 Dextrose, use in manufacture of sweetened condensed skim milk, 854.
 Diabetes—
 minimum cost dietaries for, 315.
 treatment, higher carbohydrate diet method, 905.
 utilization of carbohydrate in, 751.
Diabrotica—
 duodecimpunctata, *see* Cucumber beetles.
 vittata, *see* Cucumber beetles, striped.
Diacrisia—
 obliqua, parasite of, mass rearing, 234.
 virginica, *see* Ermine moth.
Dialeurodes—
 citri, *see* Whitefly, citrus.
 kirkaldyi and *D. citri*, distinguishing characters, 690.
 Diamond-back moth, life history, bionomics, and control, 80.
Diaporthe pernicioso, notes, 228.
Diaprepes abbreviatus, notes, 548; P.R. 825.
 Diarrhea—
 bacillary white, *see* Pullorum disease.
 infectious, of cattle, 714.
Diatraea saccharalis, *see* Sugarcane borer.
Dibotryon morbosum, notes, 537.
Dictyocaulus unequalis, n.sp., notes, 431.
 Diet—*see also* Food and Nutrition.
 adequacy, relation to disease, Kans. 249.
 artificial, for rats, 752.
 deficiency diseases, *see specific diseases*.
 effect on blood formation, 892.
 milk-iron-copper, effect of prolonged feeding to rats, 753.
 Dietetics in warm climates, treatise, 750.
 Diets—
 low-cost, for emergency use, Ill. 747.
 obesity, 894, 895.
 of infants, *see* Infants.
 therapeutic, quality studies, 763, 894.
 Dihydroxystearic acid in fat of *Lactobacillus acidophilus*, 167.
Dimorphotheca spp., poisonous principles, isolation and examination, 421.
Diocetes molestae, description, 246.
Diocetophyme renale, occurrence in this country, 544.
Diomus bahamicus, notes, 695.

- Diphtheroid infections of equines in Egypt, 591.
- Diplodia*—
dry rot of corn, treatment, Iowa 60. spp., notes, Fla. 221.
- Diploscapter coronata*, notes, 229.
- Dips and dipping, research, 421.
- Diptera of Province of Quebec, 557.
- Dirofilaria immitis* in dogs, use of foudadin in treatment, 267.
- Discochaeta cognata*, notes, 247.
- Disease resistance—
effects of vitamins A and D on, 149. in animals, papers on, 347. inherited and acquired factors in, 510.
- Diseases—
communicable, affecting man, 708, 709. of animals, *see* Animal diseases and specific diseases. of plants, *see* Plant diseases and specific host plants.
- Dispharynx spiralis*, notes, 268.
- Distemper—
canine, laboratory and clinical diagnosis, 277. canine, natural and experimental virus infections, 111. fund, Field, report, 435. in minks, 596.
- Ditropinotus aureoviridis*, notes, Utah 838.
- Dog tick, American, disease transmission, 400.
- Dogs—
affections of cornea, 579. chloral hydrate narcosis in, 579. degenerating breeds, inbreeding in, 348. dislocation of ulna and radius, 711. fasting data, Mo. 95. luxation of atlas in, 580. parasites affecting, V.I. 585. vitamin C requirements, 105.
- Dollar value, changing, and production cycle, effect on dairying, U.S.D.A. 705.
- Dolomite, hydrated lime, and limestone, availability, 503.
- Dorchester, survey of the town, N.H. 445.
- Dorylaimus* spp., notes, 228.
- Douglas fir—
bacterial gall disease, 541. growth rate, 218.
- Draeculacephala mollipes*, injury to apples, 77.
- Dragon fly, green jacket, predacious on *Tabanus* spp., 243.
- Drainage—
and levees in southeast Missouri, Mo. 601. mole, summary, 118. of land overlying an artesian groundwater reservoir, Utah 118. problems of Grand River bottoms, Mo. 601. studies, Ohio 116. tax delinquency, extent and causes, Mo. 601. tile, in orchards, Ohio 874.
- Dreg meal, digestibility and feeding value, 252.
- Dreyfusia piceae*, relation to "gout disease" in balsam fir, 548.
- Drought—
effect on osmotic value of plant tissues, 25. injury in hemlock-hardwood stands in Connecticut, 660.
- Drymaria pachyphylla*, toxicity for cattle, sheep, and goats, 867.
- Ducks, trap nest for, 847.
- Dung beetle as intermediate host of *Hymenolepis cantaniana*, 267.
- Dusting, *see* Spraying and specific crops.
- Dusts, notes, Calif. 71.
- Dyeing, papers on, 324.
- Dyeing process, theory, 315.
- Dyes—
acid, effect on animal fibers, 315. adsorption test for hardness of vegetables, 365. azo, factors affecting fastness to light and washing, Ohio 156.
- Dysentery, chronic bacterial, *see* John's disease.
- Dystrophia, unapparent, and avitaminosis, 624.
- Eagle, king of birds, and his kin, 682.
- Earwig, European—
efficiency of traps in control, 387. modified McIndoo olfactometer for, 237.
- Easter lily—
diseases, control, Fla. 221. effect of electric light supplementing daylight, Ind. 49.
- Echinochloa crusgalli*, new Sclerotium disease of, 664.
- Eclipse of 1932, effect on stomatal openings in gray birch, 343.
- Economic—
and social position of South, 444. Conference, Imperial, at Ottawa, 1932, proceedings and trade agreements, 450. Conference, Imperial, 1932 report, 449, 450. planning, papers on, 444. statistics, time element in, use of analysis of variance technic, 611.
- Ectoparasites and hosts, peculiar relations, 266.
- Edestin, enzymic digest, isolation of asparagine from, 492.
- Education—
adult, for farmers, 443. adult rural, treatise, 302. agricultural, *see* Agricultural education. in Delaware, financing, Del. 126, 889.
- Egg—
albumin, *see* Albumin, egg. grades, maintaining in storage, paraffin v. asphalt base oils in, 704.

Egg—Continued.

- production—*see also* Hens, laying.
- and receipts, relation to size of flock, Kans. 288.
- annual, relation to short-period egg yields, 411.
- correcting, yeast for, Calif. 88.
- effect of vermifuges, Fla. 248.
- increase by breeding and management, U.S.D.A. 697.
- of pullets, vitamin A requirements for, Tex. 95.
- rations for, Iowa 89.
- rations, most economical, 569.
- relation to weight at sexual maturity, 847.
- studies, Iowa 89.
- variability, factors affecting, Mass. 96.

- yolk, carotenoid pigments in, 466.
- yolk index, relation to quality factors and to candlers' scores, 571.

Egg-laying contest, cost analysis study, Mich. 158.

Eggplant—

- leaf miner, notes, 80.
- Verticillium* wilt, notes, Wis. 810.
- vitamin A in, 617.
- wilt, notes, Mass. 663.

Eggplants—

- breeding, R.I. 210.
- Florida, grading, packing, and storing, Fla. 50.
- taxonomy, Mass. 652.

Eggs—

- bacteria in, 596.
- clean market, production, N.Y.Cornell 90.
- composition, from commercial egg-breaking establishments, 487.
- cooperative shipping, Ind. 89.
- cost of production, Mich. 158.
- during storage, watery whites in, Calif. 88.
- embryonic development, yolk and albumen assimilation, 702.
- fresh and storage, pH of, Ky. 571.
- fresh, use in ice cream, Kans. 257.
- from hens fed massive doses of activated ergosterol, antirachitic potency, 703.
- hatchability and production, effect of proteins in rations, 96.
- hatchability, effect of age and holding temperatures, 847; Kans. 249.
- hatchability, factors affecting, Ohio 90.
- hatchability, genetic factors determining, Conn.Storrs 511.
- incubation, *see* Incubation.
- labor income and costs, Del. 126.
- marketing on graded basis, 442.
- prices, Kans. 288.
- production and hatchability, effect of inadequate rations, Kans. 570.
- quality and prices in New York City, N.Y.Cornell 127.
- statistical data, R.I. 288.

Eggs—Continued.

- storage quality, effect of feeding ground soybeans, 846.
- summer, maintaining quality, Idaho 839.
- washed, abraded, and oiled, detection, 256.
- western, in Boston market, prices, Mass. 737.
- winter, from hens, Ohio 90.

Eggshells, cracking strength, effect of oiling, 256.

Eimeria—

- avium*, morphology and development, 594.
- canis* in dogs, 277.
- miyarui* from Norway rat, 266.
- separata* n.sp. from Norway rat, 266.
- sp., notes, 382.
- spp., cross infection experiments with rodents and domestic animals, 268.
- spp., effect on egg production of White Leghorns, 267.
- spp. from bobwhites in Ohio, 268.
- spp. of fowls in Russia, 594.

Elaphroptera dimidiata, introduction into New Zealand, 549.

Elder borer, biology and morphology, U.S.D.A. 389.

Electric—

- cooking, Me. 477.
- heaters for poultry drinking vessels, Ind. 125.
- light and power distribution systems, lightning protection, 728.
- light on farms, 120, 878.
- light supplementing daylight, effect on greenhouse crops, Ind. 49.
- lighting plants, wind, for farm household, Iowa 597.
- lights, use in greenhouse, Ind. 48.
- power from windmills in Oklahoma, 877.
- range, utensils for, Wash. 908.

Electrical response, mechanism, 188.

Electricity—

- consumption on farm operations, Ind. 126.
- costs in home and on farm, 728.
- effect on plants, 877.
- for agriculture near Bologna, 727.
- for heating hotbeds and propagating benches, Mass. 652.
- for heating purposes in dairies, 598.
- for heating soil, 287.
- for poultry houses, 287.
- for soil sterilization, 598.
- in plant culture, new use for, 878.
- industrial, agricultural, and domestic use, 728.
- on farms, analysis of load used, N.H. 441.
- on farms, consumption and costs, Okla. 121.
- on farms in Iowa, operating cost of plant, 120.
- on farms in Wales, use and cost, 727.

- Electrification of the village in Czechoslovakia, 443.
- Electrolytes, adsorption by ash-free charcoal, Mich. 488.
- Electromagnetic induction, 28.
- Elephant grass, feeding value for dairy cows, V.I. 572.
- Elevators—
costs and business required for profitable operation, Kans. 287.
farmers', trends and status, Iowa 127.
Ohio farmer owned, financial operations, 456.
- Elis thoracica*, notes, 686.
- Elm—
bark beetle, enemies of, 560.
disease, Dutch, Ohio 61.
disease, Dutch, and elm bark beetle, 70.
disease, Dutch, spread by elm cambium beetles, 245.
leaf beetle outbreak, Conn.State 157.
leaf beetle, parasite reared from, 232.
- Elodia*—
flavipalpis n.sp., description, 393.
subfasciata n.sp., description, 393.
- Emesis of bovines, 580.
- Empoa rosae*, see Rose leafhoppers.
- Empoasca*—
abrupta, notes, N.Mex. 232.
canavalia n.sp., description, 72.
fabae, see Potato leafhopper.
fabalis, notes, 72.
gossypii n.sp., description, 72.
maligna, see Apple leafhopper.
- Emulsions, artificial, churnability, 263.
- Encephalomalacia, nutritional, in chicks, 719.
- Encephalomyelitis—
equine, antiserum, 277.
equine, in Colorado, 433.
equine, particle size of virus, 592.
equine, summary, 592.
equine, transmission by mosquitoes, 434.
of chickens, 112.
- Encyrtus infidus*, biology, 246.
- Energy—
cost of household tasks, Wash. 907.
intake, daily variations, 893.
intake of well-nourished adolescent girls, 892.
- Engine—
coal dust, ignition and combustion process, 285.
combustion, spectroscopic studies, 121.
solid-injection heavy-oil, piston temperatures in, 284.
tractor, see Tractor engines.
- Enteritis—
chronic, see John's disease.
infectious, of swine, 110.
of pigs, Ind. 104.
of sheep on Romney Marsh, 716.
of young lambs, cause, 716.
paratubercular, of cattle in Valtellina, Italy, 273.
- Enterohepatitis, infectious, see Blackhead.
- Enterotoxemia—
of lambs, 276.
of sheep, immunization, 589.
- Entomological research, justifying expenditures for, 70.
- Entomology—see also Insects.
applied, problems, treatise, 545.
laboratory and field manual, 230.
memoirs, 686.
of Australia, 549.
of Puerto Rico, bibliography, 548.
textbook, 545.
- Ephedrine, effect on blood pressure of horses, 580.
- Ephestia*—
clutella and cacao beans, 390.
clutella, life history, U.S.D.A. 690.
kuehniella, see Flour moth, Mediterranean.
study of genus, 390.
- Epiblema otiosana*, biology, 389.
- Epicauta, see Blister beetles.
- Epilachna corrupta*, see Bean beetle, Mexican.
- Epilachna viginti-octo-punctata* in Mysore, 395.
- Epithelioma contagiosum, immunization of fowl and pigeon against, 105.
- Eptitrix*—
cucumeris, see Potato flea beetle.
parvula, see Tobacco flea beetle.
subcrinita, see Potato flea beetle, western.
- Ergosterol—
activated, fed to hens, antirachitic potency of eggs, 703.
activation by cold quartz mercury lamp, 474.
effect on cows, 259.
irradiated—see also Viosterol.
administration to dogs with biliary fistulae, 312.
and nonirradiated, effect of high doses on rats, 471.
effect of small doses on serum calcium, 312.
effect on calcium absorption, 312.
effect on calcium and phosphorus metabolism, 311.
effect on retention of calcium or phosphorus, 312.
excessive doses, toxic effects on young animals, 764.
overdosage, effect on calcium, 312.
isolation and identification from *Aspergillus fischeri*, 166.
properties, 631.
studies, 151.
- Eriophyes essigi*, control, Wash. 561.
- Ermine moth parasites and hyperparasites, 246.
- Erosion, see Soil erosion.
- Eruptive fever virus, experimental transmission, 582.
- Erwinia amylovora* and pathogenic fluorescent group, comparison, 68.

Erysipelothrix rhusiopathiae—
infection in lambs, 430.
notes, 276, 432.
of ovine and porcine origin, serological identity, 270.

Erythrocytes, reduction in dogs, 710.

Erythroneura—
comes, see Grape leafhopper.
dowelli, n.sp., description, 238.
obliqua control, 384.

Escherichia coli—
germicidal efficiency of lye against, 107.
notes, Ky. 111.

Eskimos, metabolism studies, 464.

Ethanol, production from molasses, P.R. 771.

Ether, effect on rate of photosynthesis in detached leaves, 507.

Ethers, thio, readily split by alkali, 4.

Ethylene oxide, weevil fumigation with, N.Y.Cornell 72.

Etiella zinckenella, see Bean pod borer, lima.

Eucoleus aerophilus, mechanical removal from foxes, 105.

Eucolia sp., notes, U.S.D.A. 83.

Eugenics, genetics, evolution, treatise, 344.

Eulan Neu, mothproofing quality, 391, 833.

Eulophus viridulus, parasite of European corn borer, 697.

Eulota sieboldiana, injurious to vegetables in Japan, 682.

Eumerus spp.—
effect of vapor heat treatment of bulbs, 687.
on Long Island, 233.

Eupelminus saltator, notes, 696.

Eupelmus—
cyaniceps amicus, notes, 696.
papa, notes, 79.

Euplectrus platyhypenae, notes, 398.

Eupteryginae, new neotropical genus from Puerto Rico, 72.

Eurrhyncha urticata, biology, 831.

Eurydema—
genus, economic status and control, 77.
pulchrum, life history, 77.

Eurygaster integriceps, relation to biotic environmental factors of Anatolia, 233.

Eurytoma—
tylodermatis, notes, 696.
xylotrechi n.sp., description, 561.

Euscepes batatae, notes, 548.

Eutettix tenellus, see Beet leafhopper.

Euthrips pyri, see Pear thrips.

Euxoa, see Cutworms.

Evaporation from salt solutions and oil-covered water surfaces, 722.

Evergreen—
cuttings, rooting, N.Y.Cornell 57.
stock, protection with paraffin, Ohio 49.

Evergreens—
balled and burlapped, paraffin for coating, N.Y.Cornell 57.
culture, pruning, and pests, N.J. 807.

Evergreens—Continued.
insects affecting, 385.
paper mulching, N.Y.Cornell 57.
transplanted, reducing transpiration in, 216.

Evetria frustrana in Quebec, 547.

Evolution—
creative, mechanism, treatise, 190.
genetics, and eugenics, treatise, 344.
in Mendelian populations, 638.
role of recurrent mutations in, 190.

Ewes—See also Sheep.
aged western, feeding tests and carcass studies, Nebr. 91.
effect of early breeding, 406.
effect of exercise, Oreg. 407.

Exanthematic typhus of São Paulo and Rocky Mountain spotted fever, relation, 400.

Exostosis, multiple, in deer, 578.

Experiment—
station bulletins, inadequate distribution to foreign countries, Minn. 318.
station proposed at Tsinghua University, China, 768.
Station Record, general indexes, editorial, 1.
stations—see also Alabama, Kansas, etc.
in 1932, editorial, 625.
in temperate countries, handbook, 621.
in temperate countries, handbook, editorial, 481.
organization list, U.S.D.A. 142.
report, U.S.D.A. 766.

Eye gnat, studies, 266.

Fabaceae, insecticidal species, chemical relationship, 683.

Fabrics—see also Textile.
stiffness from starches and sizing mixtures, 764.

Fallow for row crops, merits, Kans. 201.

Families—see also Farm family.
economic problems, 765.

Family and village in India, 302.

Farm—
accountancy data, comparative statistical study, 612.
accounting associations, extension use of material from, 443.
adjustments, emergency, in wheat area, S.Dak. 131.
animals, see Livestock and Animals.
buildings, modern, treatise, 123.
business and home, readjustments in, U.S.D.A. 738.
carts, pneumatic rubber-tired wheels for, 732.
credit, see Agricultural credit.
debt problem, 603.
debts and foreclosed land, Mo. 601.
expenses, problems in studying, 442.
family—see also Families.
growth cycle, Ohio, 139.
living in Wisconsin, Wis. 613.

Farm—Continued.

family—continued.

living, research in, scope and method, 612.

proposed method for study, 301.

home conveniences and power equipment in Oklahoma, Okla. 737.

labor, *see* Agricultural labor.

land, marginal, in southern Indiana, Ind. 885.

land values, Iowa 127.

lands, abandoned, possibilities for recreational purposes, N.H. 445.

layout, economic efficiency, Md. 129.

layout, relation to fencing costs and farm organization, Ind. 126.

leasing, stock-share, Iowa 126.

machinery, *see* Agricultural machinery.

management—

human factors in, Ind. 126, 888.

organization, and practice, recent changes in, 443.

papers on, 444.

professional, recent developments, 443.

research and economic research, interrelation, 444.

research methodology, developments, 444.

mortgage—

debt problems, 443.

experience of life insurance companies, S.Dak. 446.

foreclosures, Iowa 603.

foreclosures in Minnesota, Minn. 135.

indebtedness, volume, 442.

provisions, Okla. 737.

research, using county records in, 442.

situation, 444, 445; S.Dak. 603.

mortgages in Nebraska, 289.

mortgages in Story Co., economic analysis, Iowa 134.

motors and equipment, V-belt drives for, Idaho 285.

operating efficiency, measurement, Ind. 126.

or forest in West Virginia Appalachians, W.Va. 886.

organization in Turlock area, tests, Calif. 292.

population, changes from 1925 to 1929, Ohio 127.

population, local group organization among, Ill. 887.

power, utilization and cost, Iowa 127.

prices, indexes, Okla. 737, 740.

products, *see* Agricultural products.

property in Minnesota, mortgage loans and foreclosures, Minn. 135.

property in New York, mortgage loans and foreclosures, N.Y.Cornell 134.

readjustment programs, 443.

Farm—Continued.

real estate in Anderson County, S.C. 886.

real estate, sale values and census values, comparison, 443.

real estate situation, 1931-32, U.S.D.A. 133.

real estate values, 443; Ohio 128.

records, analysis, uses of efficiency factors in, Iowa 738.

records, keeping and using, 610.

relief and domestic allotment plan, 603.

relief measures, 444.

relief, relation to monetary reform, Okla. 288.

scales, Illinois, tests, 405.

structures, treatise, 880.

taxation, *see* Taxation.

tenancy, changes during fifty years, 442.

tenancy in Delaware, background, 443.

trade centers in Louisiana, La. 141.

Farmers—

adult education in economics, 443.

cooperative associations, 301; Fla. 298.

in Merced Irrigation District, incomes, expenses, and taxpaying abilities, Calif. 293.

Farming—*see also* Agriculture.

changes in due to nearness to industrial cities, Ind. 130.

communities, immigrant tide in, 139.

dairy, *see* Dairy farms.

group and chain, bibliography, U.S.D.A. 603.

occupations and rural youth, Conn. Storrs 888.

part-time, list of recent references, U.S.D.A. 455.

types in Iowa, place of pasture, Iowa 127.

Farms—

electricity on, *see* Electricity.

inspected, and ratio of population in milk sheds, Ohio 127.

Maryland, organization and management, Md. 129.

Piedmont Plateau and Eastern Shore, low unit costs, Md. 736.

size and law of decreasing returns, 738.

type of production and size, effect on farm expenses, 451.

Fat consumed in milk served to school children, factors affecting, 709.

Fat globules in cream, substances adsorbed on, 263.

Fats—*see also* Oils.

animal, chemical composition, 710.

in diet, effect on vitamin B requirements for lactation, 618.

sparing action on vitamin B, 468.

utilization, role of vitamin B, 760.

Fatty acids—

and fatty oils, spreading on solid surfaces, 284.

associated with corn starch, 167.

Fatty acids—Continued.

- effect on nutrition, 751.
- glyceride, from forage grasses, 487.
- vital need of body for, 464.

Feather patterns in guinea fowl, 788.

Feathers, bird, developmental physiology, 349.

Fecal material, avian, disinfection, 861.

Feces, composition, effect of yeast ingestion, 146.

Federal—

- agricultural organization, new, Okla. 737.

- Farm Board, reports, 1931–1932, 294.

- Farm Loan Board, reports, 1929–1931, 289.

- farm relief act, price-fixing provisions, Okla. 737.

Feder's number, contribution to, 710.

Feed mills, studies, Ohio 116.

Feeding experiments, *see* Cows, Pigs, *etc.*

Feeding stuffs—

- examination, photography as aid, 775.

- home-grown, best use, Idaho 838.

- inspection and analyses, Conn.State 698; Ind. 841; N.H. 90; R.I. 90; Tex. 90; Vt. 841.

- marketing procedure, local, variation in, Ind. 136.

- net energy values in combinations, 698.

Feltia annexa, *see* Cutworm, granulate.

Femoral luxation, traumatic, in dogs, 578.

Fence posts, durability and results of preservative treatment, Ark. 874.

Fenusa pumila, life history and morphology, Conn.State 399.

Fermentation products, determination, Iowa 3.

Ferrets—

- hypophysectomized, studies, 34.

- male, reproductive cycle, 35.

- reactions to electric light treatment, 34.

Ferrous iodide administered directly and indirectly, comparison, 754.

Fertility, dietary requirements, 618; Ark. 760.

Fertilizer—

- boxes, special, for plat work, 879.

- experiments—*see also* special crops. exponential yield curve in, U.S.D.A. 339.

- notes, Iowa 16.

- requirements of soils, *see* Soils.

- treatments, yields and financial returns from, Ind. 16.

Fertilizers—

- analyses, Ky. 24.

- analytical data, consumption and sales, Ind. 781.

- and soil acidity, N.J. 24.

- effect on anchorage of corn plants, Va. 41.

- in soil, movement, 184.

- inspection, R.I. 24.

- inspection and analyses, Mo. 187; N.H. 504; N.J. 24.

Fertilizers—Continued.

- nitrogenous, *see* Nitrogenous fertilizers.

- retail prices, N.Y.Cornell 504.

- studies, Fla. 178.

- used by North Carolina farmers, 1931–32, N.C. 187.

Fetal resorption in animal husbandry, 348.

Fiber—

- crude, *see* Cellulose.

- in hog rations, amounts and kinds, Wis. 839.

Fibers—

- animal, effect of acid dyes, 315.

- animal, susceptibility to clothes moth damage, 79.

- fine structure and the mechanical properties, 315.

Fibrillae in diagnosis of carcinoma and sarcoma in animals, importance, 579.

Fibrosis of udder, relation to leucocytes and streptococci, 428.

Field crops—*see also* Crops, Forage crops, Root crops, *etc.*

- research in India, 792.

Field experiments—

- design and conduct, 788.

- effect of plat arrangement upon experimental error, Ohio 38.

- reliability of Fisher's Z test, 36.

- replicated, orthogonality and confounding in, 36.

- use of paired differences in, 792.

Field plats, artificially constructed, variation in yields, 198.

Fig diseases, Calif. 60.

Fig trees, spacing, Calif. 47.

Figs—

- new variety ripened during marketing, 912.

- souring, effect of insects, 824.

- variety tests, Ga.Coastal Plain 48.

Filters, collodion membrane, studies, 489.

Filtration—

- and metafiltration, 323.

- experiments, notes, 711.

Financial survey of Michigan, U.S.D.A. 723.

Financial survey of Wisconsin, 284.

Finches of Australia in bush and aviary, 230.

Fir—

- Adirondack, sustained yield, 217.

- and spruce land, removal of hardwoods, value, Mich. 525.

- balsam, reproduction, relation to direction of exposure, 808.

- Colorado, disease of, 679.

Fire—

- ants, notes, Tex. 384.

blight—

- cankers, chemical treatment, Ohio 61.

- organism and pathogenic fluorescent group, comparison, 68.

- pathogen, overwintering and dissemination, Ark. 674.

- problem on pomaceous fruits, 376.

Fire—Continued.

- hazards from oxidizing agents as herbicides, 797.
- insurance, percentage of farm expenses for, Md. 736.
- prevention, Calif. 116.
- resistance of building materials and structures, testing, 125.

Fires—

- farm, prevention and control, 126.
- forest, *see* Forest fire.

Fish—

- and fish products from Union of South Africa, 450.
- copper, iron, and manganese in, 752.
- food, productiveness of Minnesota lakes, Minn. 544.
- liver oils, vitamin A in, 150.
- meal as food for clothes moths, 692.
- meal as livestock feed, 698.
- meal v. cottonseed meal for dairy cows, Md. 572.
- meals, vitamin content and protein efficiency, N.Y. Cornell 90.
- oils as source of vitamin D for chicks, Wash. 845.
- protein analyses, Calif. 88.

Fisher's Z test in analysis of variance, auxiliary tables for, 792.

Fishes of Missouri, 543.

Flannel moth in Arizona, 73.

Flax—

- Ascochyta* disease, 65.
- diseases, control methods, 222.
- fiber cells, production, 646.
- for seed, Me. 353.
- rotation and tillage experiments, U.S.D.A. 789.
- rotation experiments, U.S.D.A. 789.
- seed bed preparations, Kans. 200.
- seed, variety tests, Oreg. 354.
- seed, variety yields in Michigan, Mich. 621.
- variety on peat land, Minn. 201.
- variety tests, Alaska 36; Calif. 37; Iowa 37; Kans. 200

Flaxseed market and tariff, Mont. 606.

Flea beetles, new nematode parasitic in the body cavity, 695.

Flesh fly larvae, nutrition, 394.

Flies—

- bloodsucking and nonbloodsucking, relation to human welfare, 243.
- house, *see* House flies.
- white, *see* Whiteflies.

Floors—

- durable finishes for, Mich. 621.
- wood, over concrete subfloors, conditions for laying, 120.

Florida—

- fauna and flora, when primeval wilderness, 381.
- Station, notes, 910.
- Station, report, 317.

Flotation process, 323.

Flour—*see also* Bread.

beetle—

- confused, biology, 395.
- confused, growth of population, mathematical theory, 396.
- rust-red, biology, 395.
- ether extract of, vitamin A in, 168.
- given volume, variation in weight, 460.
- moth, Mediterranean, sporozoan disease of larvae due to *Thelohania ephestiae*, 247.
- other than wheat for cakes and muffins, 892.
- quality, factors affecting, Kans. 200.
- quality, testing by recording dough mixer, 460.
- soft wheat, testing, 460.
- wheat, keeping quality, Ind. 3.

Flower thrips—

- Florida, notes, Fla. 231.
- western, life history and distribution, 827.

Flowers—*see also* Plants, ornamental.

- culture, Ohio 807.
- culture experiments, Alaska 47.
- nutrient needs, Ohio 49.
- studies, Kans. 210.
- time of bloom, effect of supplementing daylight with electric lights, Ohio 49.

Fluids—

- biological, ammonia determination in, 172.
- small quantities, colloid osmotic pressures in, 488.

Fluorescence of *Lolium* seedlings in ultra-violet light, 345.

Fluorine—

- compounds, relative toxicity as stomach insecticides, 824.
- determination, Mich. 489.
- effect on nutrition of swine, 843.
- effect on reproduction and lactation in swine, Ohio 90.
- effect on tobacco plant, 649.
- physiological effects, 754.
- poisoning of dairy cows, plasma phosphatase in, 414.

Fly sprays, studies, Calif. 97; Iowa 98.

Foals, entropion operation in, 592.

Fodder crops, *see* Forage crops.

Follicle activity, chemico-histological systems in, 315.

Fomes lamaoensis, notes, 373.

Fomes lignosus (?), notes, 373.

Food—*see also* Diet.

- and nutrition, chemistry of, trend of recent advances in, 890.
- and nutrition studies, Fla. 303.
- chemistry, treatise, 747.
- consumption and production for home use, Wis. 908.
- consumption and use, effect of vitamins B and G, 899.
- costs at farm and city prices, 600.
- health, vitamins, treatise, 303.

Food—Continued.

- in health and disease, treatise, 889.
- iodide determination in, 633.
- of ancient Hawaiians, 143.
- plants of Malayan insects, 76.
- poisoning from harmless foods, 897.
- poisoning, *Salmonella*, problems, 897.
- purchasing for the home, textbook, 477.
- research laboratory of South Carolina, discontinuance, 320.
- selection and distribution in emergency relief work, 894.
- selection, habits and aspects of health, 890.
- studies, index to literature, 890.

Foods—

- acid, bacteria in, importance of temperature on survival time, 306.
- artificial, N.Y.Cornell 72.
- canned, *see* Canned foods.
- frozen, microbiology, 462.
- microbiology, treatise, 746.
- of Puerto Rico, nutrition studies, 617.
- textbook for beginners, 303.
- utilization studies, Mass. 747.
- vitamin C in, chemistry and conservation, 902.

Foot-and-mouth disease—

- experimental, changes of blood in, 710.
- in cats, 578.
- in goats from artificial infection, 578.
- in Southern Rhodesia, emergency inoculation, 714.
- problems, 579.
- transmission to dogs, 710.
- virus, destruction, 711.
- virus, disinfectants for, tests, 578.
- virus, increased virulence in sensitized guinea pigs, 580.
- virus, plurality, 710.
- virus, resistance to light from various sources, 578.
- virus, tenacity in milk and dairy products, 270.

Forage—

- crops—
 - experiments, Wyo. 791.
 - for central Washington, Wash. 790.
 - for fattening hogs, S.C. 254.
 - for swine, Del. 89.
 - in Wales, studies, 644.
 - insects affecting, U.S.D.A. 644.
 - studies, Mass. 643.
- grasses, *see* Grasses.
- green, determining water content, Iowa 38.
- plants, research, 320.
- poisoning, *see* Livestock poisoning.
- Plants, poisonous, and *specific plants*.
- roots, accomplishments of station with, Alaska 36.

Forest—

- associations in uplands of Gulf Coastal Plain, 58.
- burning, effect on reproduction, 58.

Forest—Continued.

- education, treatise, 370.
- fire retardent, calcium chloride as, 661.
- fires, area class study, Ohio 810.
- growth, storm injuries in Switzerland, 14.
- insects in Hawaii, 385.
- insects of Swiss National Park, 687.
- litter, composition, Conn.State 217.
- litter, decomposition under field conditions, 339.
- News of Ohio, Ohio 217, 810.
- nursery seed beds, weed eradication, Mich. 525.
- or farm in West Virginia Appalachians, W.Va. 886.
- plantations, injury by roosting birds, 382.
- planting stock, distribution, Conn. State 217.
- planting stock, water storage, 661.
- soils, microbiology, 23.
- soils, porosity and water absorption, 779.
- taxation, changes in, U.S.D.A. 448.
- trees, *see* Trees.

Forestit, new contact insecticide, 233.

Forestry—

- an economic challenge, treatise, 660.
- and land-use, 601.
- at Ohio Station, Ohio 57.
- Experimental Stations, International Congress, proceedings of entomological section, 234.
- manual, 59.
- origin of seed used in, importance, 370.
- possibilities in Missouri, Mo. 601.
- studies, Ga. 217.
- survey in Virgin Islands, V.I. 525.
- uses of land in Massachusetts, Mass. 291.

Forests—

- even-aged, stand-density index for, 525.
- losses caused by defoliation, determination, 71.
- of Maine, 660.
- of southern New England, drought injury, 660.
- privately owned, in Europe, present conditions, 602.
- Vermont, natural reproduction in, Vt. 809.

Forficula auricularia, *see* Earwig, European.

Formaldehyde—

- dust for growing seedlings, Ohio 220.
- value against mastitis, 108.

Formicidae from stomachs of lizards, 230.

Fortier, Samuel, pioneer in farm irrigation, editorial, 769.

Foulbrood-like disease of bees, 560.

Fowl—

- cholera in turkeys, Calif. 104.
- cholera, studies, Nebr. 578.

Fowl—Continued.

- diphtheria, resistance to chemical disinfectants, 578.
- embryos, chondrodystrophy in, 196.
- paralysis, *see* Paralysis.
- pest, Korean, studies, 421.
- pest virus, studies, 594.
- pneumonia, N.H. 420.
- pox immunization by pigeon pox virus, 112, 420; Ohio 104.
- pox, immunization of fowls and pigeons against, 112.
- pox in baby chicks, Hawaii 698.
- pox, pigeon pox virus for, use in egg-laying contest, 279.
- pox vaccination, stick method, 861.
- pox vaccine, Calif. 104.
- pox vaccine, storage, N.H. 420.
- pox virus, resistance to chemical disinfectants, 578.
- typhoid—
 - breeding for resistance, Iowa 104.
 - in guinea fowls, 115.
 - of turkeys, chronic carrier, 595.
- typhus, studies, Nebr. 578.

Fowls—*see also* Chicks, Hens, Poultry, *etc.*

- anatomy and physiology, 593.
- blood groups in, 719.
- chromosomes in, 195.
- course of energy and nitrogen metabolism during fast, Mo. 94.
- creeper, studies, 195, 196.
- digestive tract, microscopic anatomy, 702.
- effect of blood loss on resistance to parasitism, 278.
- fate of antirachitic factor in, 703.
- four-gene autosomal linkage group in, 31.
- growth rate, inheritance, 348.
- inheritance of flightless character in, 31.
- inheritance of spangling in, 195.
- inherited autosomal factors in, 31.
- new respiratory disease, 435, 863.
- of Uganda, host for trypanosomes, 596.
- ova, growth and chemical composition, 255.
- partial sex reversal in, 511.
- pH of intestinal contents, effect of milk rations, Ohio 90.
- rumpleness in, cause, 788.
- White Leghorn, spurlessness in, 641.

Foxes, ranch raised, myiasis in, 548.

Foxtail grass, meadow, infestation by gall midge, 558.

Frankliniella—

- californica*, life history and distribution, 827.
- fusca*, *see* Tobacco thrips.
- tritici*, *see* Flower thrips.

Freesia corms, altered rate of growth, 189.

Fruit—

- bacterial spot, Del. 60.
- beetle, dried, odors of micro-organisms for control of, 233.

Fruit—Continued.

- blossoms, insect visitors, 73, 76.
- branches, artificial winter test for, 212.
- crops, effect of the March freeze of 1932, Ga. 209.
- diseases, control, N.Y.Cornell 61.
- diseases, control by new method, U.S.D.A. 652.
- farm, organization studies, N.H. 445.
- flies, South African, records and new species, 686.
- fly, Mediterranean, importance in Hawaii, 385.
- fly, Mediterranean, value of trapping in, 559.
- fly, Mexican, studies, U.S.D.A. 82.
- fly, Mexican, survival, relation to temperature and humidity, 634.
- growing in Ecuador, importance, 624.
- industry, export, of South Africa, 450.
- industry of State, seasonal variations, Kans. 288.
- industry, trend toward higher quality production, U.S.D.A. 652.
- injuries, relation to insects, 245.
- juice filter, muslin tube, description, Mich. 3.
- juice, sterilization with heat developed by resistance to alternating electric current, Iowa 143.
- juices, jellation, factors affecting, Del. 3.
- juices, jellying power, effect of micro-organisms, Mass. 633.
- moth, oriental—
 - bait traps for, efficiency, 831.
 - bionomics and control, Del. 71.
 - cocoon parasites, 390.
 - expectations from in 1932, 385.
 - in Japan, new parasite, 246.
 - in Michigan, 547.
 - in Niagara Peninsula, history, 548.
 - life history and control, 390.
 - native parasites as control, Mich. 561.
 - natural control, chrysopids as factor, 548.
 - notes, 384; Ind. 71; Ohio 72.
 - parasite, breeding, 246.
 - parasites, Conn. State 231, 546.
 - parasites in Michigan, 837.
 - parasites in Ontario, 548.
 - parasites, introduction, Mass. 686.
 - parasites, new hymenopterous, 399.
 - shipping in refrigerated containers, 71.
 - summer oil emulsions for, 236.
- pests, new methods of control, U.S.D.A. 652.
- products, frozen, new quick methods, 749.
- products, studies, Calif. 143.
- scald and leaf scorch, N.Y.Cornell 61.
- stocks, studies, Nebr. 520.

Fruit—Continued.

- tree die-back in Western Cape Province, 536.
- tree diseases, 526.
- tree little leaf, notes, Calif. 60.
- tree roots, winter injury, nature and cause, N.Y.Cornell 53.
- trees—
 - fertilizer requirements, Oreg. 365.
 - gall midges affecting, 73.
 - in West Virginia, pollination, W.Va. 212.
 - mulching, amount, N.J. 803.
 - stock and scion relation, 522.
 - tropical, grafting, Hawaii 524.
 - winter moth caterpillar on, 72.
- washer, experimental, Wash. 880.
- Fruits—*see also* Orchards, Apples, Peaches, *etc.*
 - acidity, effect of carbon dioxide, 50.
 - bramble, irrigation, Oreg. 364.
 - breeding, 799.
 - changes during freezing storage and thawing, Calif. 772.
 - citrus, *see* Citrus.
 - culture experiments, Alaska 47.
 - culture, relation to soils, N.Y.Cornell 53.
 - current research, types, 891.
 - dried, insects affecting, 549.
 - fertility relations, 653.
 - fertilizer experiments, Ga. 209.
 - for maintaining alkaline reserves in body, tests, Calif. 143.
 - fresh, shipping overseas, Calif. 143.
 - gas storage, 803.
 - Georgia, shipping containers, Ga. 209.
 - histological and cytological studies, 212.
 - improvement through tree-performance records, U.S.D.A. 53.
 - inactive malic acid in, determination, 494.
 - mutations in, 799.
 - new or noteworthy, N.Y.State 367.
 - official standards for grading, Fla. 50.
 - oxygen uptake, effect of carbon dioxide, 50.
 - Philippine, pectin in, 748.
 - preservation, V.I. 520.
 - preservation by freezing, Ga. 209.
 - preservation, quick freezing v. slow freezing methods, Calif. 143.
 - reducing substance and vitamin C in, 8.
 - set, effect of spring freezes, N.Mex. 210.
 - small, breeding, Oreg. 364.
 - small, variety tests, Me. 364.
 - spray schedules for, Mo.Fruit 654.
 - stone, spoilage on market, U.S.D.A. 68.
 - storage, 537.
 - storage, biological effects of humidity on, 538.
 - variety and cultural tests, Ind. 798.
 - variety tests, Fla. 209; Ga. 209; Ga.Coastal Plain 48; Mass. 652.
 - vitamin C in, 310.

Fuel—

- blends of alcohol and gasoline, performance tests, 729.
- oils, commercial standard, 729.
- research, measuring detonation, 121.

Fuels—

- for curing tobacco, comparison, Conn. State 519.
- multiple, in an injection motor, tests, 876.
- tests in tractor engines, 731; Mich. 597.

Fundella cistipennis, notes, P.R. 825.

Fungi—

- and bark beetles, interrelations, 560.
- cultivation, 372.
- entomogenous, notes, 372.
- heterothallism and hybridism in, 372.
- in India, 373.
- isolation from soils by plate method, 184.
- parasitic, from Iowa, supplementary list, 811.
- relation to stored hay and corncob meal, Iowa 27.
- soil, in Iowa soils, occurrence and activities, Iowa 16.
- wood-destroying, in timber, effect of season of felling, 372.
- wood-destroying, on timber of buildings, effect of fillers, 680.
- wood-destroying, on wood coated with paints and varnishes, effect, 681.

Fungicides—*see also* Sprays and specific kinds.

- analyses, Me. 520.
- compatibility with oil emulsion-cresylic acid sprays, 684.
- composition, Conn.State 234.
- copper, *see* Copper.
- direct effect on wheat, 668.
- dust, for control of seed-borne diseases of wheat and oats, Iowa 60.

Fur resources, 543.

Fur-bearing animals—

- intestinal parasites, 544.
- lungworms infesting, identification, 544.
- predatory, in Michigan, food habits, 381.

Fusarium—

- betae* as potential agent of root rot, 672.
- conglutinans*, notes, 531.
- foot rot on peas, Ariz. 65.
- lini*, intracellular globulin, determining specificity, 27.
- nivale* on British cereals, 665.
- orthoceras pisi*, notes, U.S.D.A. 670; Wis. 533.
- oxysporum* on glucose, carbon metabolism, 374.
- saltation in, nature, Minn. 527.
- spp. in cultures, temperature relations, 65.
- spp., notes, Fla. 221; Minn. 529.

- Fusarium*—Continued.
vasinfectum aegyptiacum, penetration into cotton roots, 65.
Fusicladium dendriticum, see Apple scab.
 Futures trading and legislation in agricultural commodities, 610.
Galerucella xanthomelaena, see Elm leaf beetle.
Galesus sp., notes, U.S.D.A. 83.
 Gall midges—
 affecting fruit trees, 73.
 and grass seed production, 320.
 enemies of mealybugs, list, 693.
Galleria mellonella, see Wax moth.
 Galls, animal, of plants in South and Central America, 382.
 Game management—
 chair of, establishment, 623.
 treatise, 543.
 Gametogenesis, studies, 267.
 Gardens—
 farm, management, Ind. 798.
 informal, treatise, 524.
 of fragrance, treatise, 216.
 vegetable, planning, planting, and care, Okla.Panhandle 210.
 Gas—
 domestic uses, 765.
 illuminating, effect on young oak trees, 507.
 mixtures, manometric analysis, 171.
 mixtures, toxicity to insects, determination, 825.
 Gasoline—
 and alcohol, blending for motor fuel, Idaho 871.
 and alcohol fuel blends, performance tests, 729.
 tetraethyl lead and octane number, relation, 730.
 Gasolines—
 examination, Me. 437.
 gum-bearing, laboratory experiments, 121.
 Gastric juice from swine for treatment of pernicious anemia, 314.
 Gastro-enteritis in sheep and lambs, parasitic, treatment, 105.
Gastrophilus intestinalis, see Botfly, horse.
 Gelatin—
 dispersions, effect of high initial aging temperatures, Mass. 705.
 use in sherbet mixes, Kans. 257.
 Gelatinolysis, studies, 324.
Gelechia gossypiella, see Bollworm, pink.
 Gelechiidae, life history, 392.
 Gels, elastic and nonelastic, free and bound water in, Minn. 318.
 Genes for creeper and single-comb fowl, linkage of, 196.
 Genetics—
 animal, papers on, 347.
 evolution, and eugenics, treatise, 344.
 paradoxical terminology in, Minn. 318.
 studies, effect on cattle breeding, U.S.D.A. 705.
 Geology and colloid chemistry, 323.
 Geometridae of South Africa, 557.
 Georgia—
 Coastal Plain Station, report, 157.
 College, notes, 159.
 Station, notes, 159.
 Station, report, 317.
 Geranium cutting rot, N.Y.Cornell 61.
Gibberella saubinetii, notes, 64, 814.
 Ginseng blight control by Bordeaux mixture and injury from, Ohio 374.
 Gipsy moth—
 and contact sprays, Mass. 687.
 control, Conn.State 231, 546.
 control, relation to share tree problem, 385.
 parasite, introduced ichneumonid, 398.
 parasites, interrelations, and larval instars, 86.
 status in United States, 690.
 Girls—
 adolescent, food requirements, 892.
 basal metabolism, standards for predicting, 750.
 Gizzard worm of poultry, 268.
 Gladioli—
 culture, winter, R.I. 210.
 diseases, control, Fla. 221.
 forcing with artificial light, Mass. 652.
 Gladiolus—
 corms, storage, Iowa 48.
 scab, control, Ohio 61.
 thrips—
 control, 547, 827; N.Y.Cornell 57.
 control in field and greenhouse, 688.
 in California, 73.
 life history studies, 688.
 notes, N.Y.Cornell 72; Ohio 72.
 on corms in storage, control, 688.
 papers on, 387.
 status in United States, 688.
 studies, Mich. 76.
 Glanders, serodiagnosis for, 578.
 Globulin from *Fusarium lini*, specificity, 27.
Gloeosporium perennans, notes, 536.
Gloeosporium piperatum, notes, 373.
Glomerella cingulata, notes, 228.
Glomerella sp., notes, 526.
 Glossina—
 distribution in Bechuanaland protectorate, 420.
 , bionomics and control, 694.
 , trypanosome infections, 420.
 palpalis, transmission of trypanosomes to fowls by, 596.
 Glover's scale, notes, Tex. 384.
 Glucose in plant extracts, determination, 174.
 Glucoside formation in commoner monoses, 166.
 Glucuronic acid—
 as growth factor in guinea pigs, 616.
 production in scurvy, 762.
 Glutamine in presence of asparagine, estimation, 492.

Glutathione—

- and ascorbic acid in animal tissues, 471.
- concentration and hereditary body size in rabbits, 787.
- cuprous, preparation, 484.
- of blood, determination, 172.

Glutelins—

- of cereal, preparation, Nebr. 484.
- studies, 165.

Gluten, quality, factors affecting, Kans. 200.

Glycerine in veal broth, relation to potency of tuberculin, 105.

Glycerol, freezing and flow points for, 122.

Glycine, cupric complexes, 632.

Glycinin of soybean varieties, differences in amino acid content, 4.

Glycyl-tyrosine, titration constants, 5.

Glyoxalase, properties, 485.

Glypta rufiscutellaris—

- notes, 837.
- parasite of oriental fruit moth, Mich. 561.

Gnoringoschema—

- glochinelia*, see Eggplant leaf miner.
- lycopersicella*, description and injury, 80.
- operculella*, see Potato tuber worm.

Goats—

- milk, improvemet, N.Mex. 193.
- milk secretion stimulation, N.Y.Cornell 36.
- parasites affecting, V.I. 585.
- poisoning with *Chrysocoma tenuifolia*, 421.

Goiter and iodine problem in New Zealand, 315.

Gold and prices, N.Y.Cornell 127.

Gold, world production, efficiency in use and monetary stocks, N.Y.Cornell 127.

Gonads of mice, development and morphology, 352.

Gonderia mutans, notes, 718.*Gongylonema* in deer, second record, 268.

Gooseberries—

- defoliation by sulfur-containing sprays, 228.
- root growth under different fertility conditions, 654.
- varieties, breeding, culture, and use, N.Dak. 369.

Governmental costs, reduction, Wis. 881.

Grafting materials and methods, Ohio 49.

Grafting methods to prevent formation of callus, Iowa 48.

Grafting waxes, comparative merits, Iowa 48.

Grain—

- bins, empty, spray for insect control, 824.
- borer, lesser, life history, 835.
- bug, relation to biotic environmental factors of Anatolia, 233.
- crops, effect of plowing under straw, Calif. 37.

Grain—Continued.

- drier, notes, Ind. 116.
- elevators, costs and incomes, Ind. 126.
- for dairy calves, grinding, Ind. 116.
- grinding and elevating, with one-half h.p. motor, Mich. 123.
- insects, effect of radio waves, 685.
- insects in Alberta, 549.
- inspection laboratory of Montana, eight years' work, Mont. 46.
- marketing procedure, local, variation in, Ind. 136.
- production in Germany, effect of climate, 178.
- smuts in Russia, large scale control, 666.
- storage facilities on farms, Kans. 287.
- storages for Corn Belt, designs, U.S.D.A. 600.

Grains—see also Cereals and Oats, Rye, Wheat, etc.

- cereal, feeding experiments, U.S.D.A. 644.
- grinding for dairy cows and calves, Ind. 98, 849.
- ground, in laying mashes, Ind. 89.

Gram—

- diseases, 526.
- gigantism in, 192.
- types, cytology, 191.

Granary weevil, breeding in flour, 233.

Granuloma—

- bovine nasal, cause, 587.
- bovine nasal, identity of schistosome found in, 588.
- in cattle in Colorado, coccidioidal, 587.

Grape—

- berry moth, bionomics and control, Del. 71.
- berry wilt and rot, notes, 540.
- colaspis, notes, Fla. 231.
- diseases, spraying requirements for, Fla. 221.
- juice, commercial sterilization and storage, Mich. 494.
- juice, intensification of corrosion by sulfuric acid in, Calif. 3.
- juice, moldy, due to faulty pasteurization, Mich. 494.
- juice, sterilization with heat developed by resistance to alternating electric current, Iowa 143.
- leafhopper, bionomics and control, Del. 71.
- leafhopper in California, control, 387.
- phylloxera in Queensland, 555.
- stocks, esca on, 539.

Grapefruit—

- juice and slices, canned, Vitamin C in, 309.
- juice, fresh, vitamin C in, 309.
- vitamin C in, 310.

Grapes—

- chrysomelid pest of, 84.
- Concord, flower bud formation in, 659.
- cost of packing and distribution, N.Y.Cornell 127.

Grapes—Continued.

- crosses with genetically pure vinifera grapes, 805.
- culture in Minnesota, Minn. 659.
- eastern, marketing, N.Y.Cornell 127.
- fertilizer experiments, P.R. 798; R.I. 210.
- Fredonia, new variety, description, Mich. 56.
- grafting, R.I. 210.
- muscat, outlook, Calif. 883.
- mutations in, 28.
- parthenocarp and seed abortion in, 805.
- pruning, Idaho 798; Iowa 48.
- pruning, thinning, and girdling, Calif. 47.
- returns to country shippers, N.Y.Cornell 127.
- rootstocks for, Calif. 47.
- seedless, hardy in western New York, 523.
- Seneca, description, N.Y.State 367.
- table, world production and trade, 612.
- varieties, jellying properties, Fla. 303.
- variety tests, Fla. 209; Ga.Coastal Plain 48; Kans. 210.

Grapevines—

- fertilizer experiments, Alaska 47.
- Muscadine, pruning, Ga. 209.

Graphium ulmi, notes, 70.*Grapholitha*—

- molesta*, see Fruit moth, oriental.
- prunivora*, notes, 232.

Grass—

- artificially dried, digestibility and feeding value, 249.
- artificially dried, for dairy cow, effect on butter, 320.
- fresh and artificially dried, comparative digestibility and feeding value, 250.
- mixtures and alfalfa v. pure stands, Ohio 38.
- mixtures for pastures, tests, N.Y.Cornell 38.
- native blue top, analyses, Alaska 36.
- seed production and gall midges, 320.
- seedlings, development, effect of frequent clipping, 792.

Grasses—see also Grassland, Lawngrasses, Meadows, and Pastures.

- accomplishments of station with, Alaska, 36.
- adaptation for range improvement, N.Mex. 200.
- and clover mixtures for bottom land, 354.
- as forage crops, Wash. 790.
- chemical composition, 405.
- composition, with different fertilizers, Hawaii 643.
- effect of nurse crop, 644.
- fertilizer requirements, R.I. 200.
- for fattening beef cattle, comparison, Fla. 248.
- for hay and pasture, Iowa 37.

Grasses—Continued.

- for lawns, variety tests, Alaska 36.
 - forage, glyceride fatty acids from, 487.
 - forage, pasture, and lawn, variety tests, Fla. 199.
 - forage, production and palatability tests, V.I. 512.
 - forage, tests, Hawaii, 643.
 - forage, variety tests, P.R. 790.
 - grown in various ways, nitrogen and minerals in, 644.
 - insects affecting, Kans. 232.
 - pasture, adaptability to soils of Everglades, Fla. 248.
 - pasture, chemistry, Mass. 705.
 - pasture, digestibility, effect of artificial drying, 403.
 - pasture, effect of intensity of grazing, 402, 403, 404.
 - pasture, mineral-deficient, effect, 403.
 - pasture, studies, Fla. 199.
 - pasture, vitamin A in, Idaho 898.
 - prairie hay, of Nebraska, identification, Nebr. 28.
 - range bunch, composition and digestibility, 405.
 - range, of Hawaii, Hawaii 793.
 - turf, fertilizer experiments, Mass. 643.
 - variety tests, Kans. 200; Oreg. 354; Wyo. 791.
 - yield and composition, factors affecting, Fla. 199.
- Grasshopper bait poisons, relative toxicity, 238.
- Grasshopper baits, notes, N.Mex. 232.
- Grasshoppers—
- American, control, Fla. 231.
 - bait-poisoned, arsenic in, 73.
 - control, Kans. 232.
 - egg deposition, poisons, attractants, and parasites, Iowa. 72.
 - injurious, in Manitoba, habits, 553.
 - notes, Mont. 232.
 - outbreak in 1932, 76.
 - outbreak in Tennessee, 73.
 - quantity of bait eaten by, Iowa 71.
- Grassland—see also Grasses, Meadows, and Pastures.
- management, effect on turf, 320, 792.
 - management, intensive system, 249.
- Grazing—see also Range.
- lands, Calif. 37.
 - more profitable methods, U.S.D.A. 644.
 - possibilities of Moose Pass region, Alaska 157.
 - relation to land planning, 444.
 - rotational, effect of varying rest period, 644.
- Green manure—
- crops, value, Wis. 791.
 - crops, variety tests, Hawaii 643.
 - effect on soil composition, Fla. 178.
 - substitute for stable manure, R.I. 178.
 - use, N.Y.Cornell 50.
- Greenhouse heating plants, design and improvement, U.S.D.A. 124.
- Greenhouses, treatise, 124.

- Groundsels, American, poisonous to livestock, 272.
- Grouse, *Pasteurella tularensis* from, 271.
- Growth, nature and mechanism, 464.
- Growth studies, 899.
- Guinea fowls—
castration, effect, 198.
feather pattern formation in, 788.
- Guinea grass, feeding value for dairy cows, V.I. 572.
- Guinea pigs, paratyphoid epidemics, 869.
- Gummosis of fruit trees, studies, 673.
- Gymnosporangium* genus, pathogenicity and morphology, Iowa 60.
- Gyrinidae, hymenopterous parasites, 696.
- Habrocytus* sp., notes, 696.
- Habrolepis dalmanni*, parasite of oak scale, 388.
- Haemonchus contortus*—
in sheep, effect of plane of nutrition, 320.
notes, 276, 431, 590.
proteins, detection in sera of animals, 267.
- Haemoproteus* infection of pigeons, 267, 864.
- Hail damage to crops, basis of estimation, 775.
- Hail insurance in Canada, 610.
- Hair growth, mammalian, studies, 315.
- Hairs, animal, structure, problems in X-ray analysis, 315.
- Halibut-liver oil, properties, 465, 756.
- Halticinae, cereal-infesting, life history, habits, and morphology, 233.
- Ham and shoulders, exports from United States, 1920-32, Ohio 600.
- Ham beetle, red-legged, notes, 695.
- Hams of different sizes, relative economy, 747.
- Hapalosphaeria deformans*, new fungus for North America, 821.
- Harlequin bug, control, 77.
- Harmolita*—
grandis, see Wheat straw worm.
secalis, distribution and damage, Utah 837.
tritici, see Wheat joint worm.
vaginicola, distribution and damage, Utah 837.
websteri, distribution and damage, 837.
- Hawaii Station report, 766.
- Hawthorn fruit moth, biology, 389.
- Hawthorn fruits, inhibitory substance in, effect on potato growth, Kans. 189.
- Hay—
Alaskan, harvested at different stages, composition, 512.
artificial drying, 879.
artificial drying in Russia, 287.
artificially dried, digestibility, 251.
chopped and whole, costs of storing, 733.
choppers, Calif. 116.
chopping, Ohio 116.
- Hay—Continued.
crops in rotations, fertilizing value, Ohio 38.
crops, variety tests, N.Mex. 200.
crusher mowers for, Calif. 116.
curing, effect of plant physiological reactions, 732.
drier, notes, Ind. 116.
driers, new developments in, 733.
driers, power, labor, and fuel requirements, 733.
fever, autumn, relation to ragweed, U.S.D.A. 651.
fork and silage cutter, modified, for storing hay, comparative efficiencies, Iowa 98.
handling methods, Ohio 116.
land, run-out, fertilizer experiments, N.H. 502.
making machinery, development, 320.
making, tests of mower-crusher in, 440.
marketing by modern methods, U.S.D.A. 610.
marketing procedure, local, variation in, Ind. 136.
measuring and weighing, Oreg. 354.
oats and legume mixtures for, Calif. 37.
stored, fungi in relation to, Iowa 27.
vitamins B and G in, factors affecting, Ohio 839.
yield and botanical composition, effects of manure, fertilizer, and lime, 39.
- Health preservation, means of, 891.
- Heartwater, etiology, 420.
- Heat—see also Temperature.
and thermodynamics, standard symbols for, 119.
production of large rats during prolonged fasting, 148.
- Heating—
domestic, higher efficiency in, 317.
plants, greenhouse, design and improvement, U.S.D.A. 124.
systems for farm homes, U.S.D.A. 157.
- Heifers—see also Cows.
feeding experiments, Okla. Panhandle 573.
finishing, wheat v. corn for, Nebr. 562.
Holstein, growth, effect of rations, 412.
sorghum grains v. corn for, Kans. 257.
- Helicobasidium longisporium*, notes, 526.
- Heliothis obsoleta*, see Corn ear worm.
- Heliothrips fasciatus*, see Bean thrips.
- Hellebore, western false, poisonous to bees, 87.
- Helminthiasis prophylaxis, action of vitamin A in, 268.
- Helminthic infestations, susceptibility and resistance, 266.
- Helminthology, Canadian, review, 683.
- Helminthology for 1931, bibliography, 268.
- Helminthosporium*—
foot rot, notes, Kans. 222.
gramineum, notes, U.S.D.A. 62.

Helminthosporium—Continued.

oryzae, internal infection of rice seeds, 66.

oryzae, notes, 225.

saltation in, nature, Minn. 527.

turcicum, notes, 373.

Helminths—

from South Africa Chiroptera, 420.

parasitic, of Canadian animals, 425.

parasitic, of dogs in Marseilles, 719.

parasitic, relation to human disease in Rhodesia, 544.

Helopeltis bergrothi, effect on tea, 555.

Hematological diagnosis, treatise, 709.

Hemerocallis, pollen tube behavior in, 504.

Hemerophila pariana, see Apple and thorn skeletonizer.

Hemileia vastatrix, notes, 526.

Hemitides—

cheboyganensis n.sp., description, 697.

cushmani n.sp., description, 697.

hungerfordi, life history, 697.

Hemlock—

drought injury in Connecticut, 660.

understory, in western white pine type, treatment, 660.

Hemocytometer, Prym's, use, 579.

Hemoglobin—

in blood of anemic and healthy cattle, 413.

in blood of dairy cattle, Kans. 257.

in blood of infants, rapid fall in first week of life, Wis. 890.

regeneration, food factors in, 145.

regeneration in anemic rats with dietary supplements, 473.

Hemophilia in men and women, 508.

Hemophilus ovis, notes, 717.

Hemorrhagic septicemia, see Septicemia.

Hens, laying—see also Egg production.

calcium requirements, N.Y.Cornell 90.

confinement without succulent green feed, Del. 89.

wheat v. barley for, Calif. 88.

Hepatitis—

enzootic, of young pigs, 579.

idiopathic hemorrhagic, of swine, 432.

pyemic, of sheep, 110, 580.

Herbicides, fire hazards from, 797.

Heredity—

human, studies, 32, 508.

in animals, Kans. 193.

in barley, 190, 344.

in Hope wheat crosses, 347.

in Indian chilies, 639.

in *Nicotiana tabacum*, 191.

in peaches, 803.

of acquired specific poison supersensitivity, 349.

of anomaly in corn, 344.

of anthocyanin pigmentation in Asiatic cottons, 783.

of black spotting in Holstein cattle, 348.

of blood groups in domestic animals, 640.

of bristles in millet, 784.

Heredity—Continued.

of bunt resistance in Albit wheat, 346.

of cancer susceptibility in mice, 788.

of characters in ragi, 29.

of color—see also Color inheritance. and pathogenicity in crosses of wheat rust, 64.

of dwarfing in wheat, 30.

of flightless character in fowls, 31.

of *Fusarium* resistance in *Brassica* spp., 813.

of growth rate in fowls, 348.

of intelligence in man, genetical formula, 32.

of iso-hemagglutinogens in rabbits, 509.

of piebald patterns and wall eyes, 640.

of polydactyly in guinea pigs, 32.

of size, 193.

of slipped tendons in poultry, Kans. 249.

of spangling in fowls, 195.

of waxy endosperm in sorghum, 784.

sex-linked, correlation of relatives, 32, 33, 511.

Hernia, diaphragmatic, in domestic animals, 711.

Herpestomus brunneicornis, notes, 246.

Hessian fly—

control, Nebr. 547.

in Pacific Northwest, U.S.D.A. 692.

notes, Kans. 232.

survey, Iowa 71.

Heterakis gallinae—

development, 280.

life history, 281.

n-butylidene chloride for, 106.

Heterakis spp., notes, 268.

Heterocordylus malinus, see Apple redbug.

Heterodera—

genus, bibliography and host list, 542.

marioni, plants attacked by, list, U.S.D.A. 681.

radicicola, see *Caconema radiculicola* and Nematodes.

schachtii, importance to potato production, 534.

Hevea brasiliensis, see Rubber.

Hexachlorethane, action on isolated small intestine of bovines, 578.

Hexameris microamphidis, notes, U.S.D.A. 692.

Hexane, oxidation, 730.

Hexuronic acid—

and vitamin C, identity, 11, 169, 774, 902.

crystalline structure, 10.

from suprarenal glands, vitamin C activity, 10.

Hexylresorcinol—

against internal parasites, clinical experiences, 266.

as general vermicide, 272.

Hibiscus, Turk's-cap, resistance to *Phymatotrichum* root rot, Tex. 528.

Hickory—

aphid, black, control, 239.

- Hickory—Continued.
 aphid, black, notes, Fla. 231.
 shuck worm, notes, Fla. 231.
- Hide and skin industry in South Africa, 450.
- Hide beetle, notes, 695.
- Highway construction costs in Illinois, trend, U.S.D.A. 723.
- Highways, *see* Roads.
- Hippelates pusio*, studies, 266.
- Hog cholera—
 splenic lesions in, 718.
 studies, 710.
 virus in preserved carcasses, viability, 432.
- Hogs, *See* Pigs.
- Holcocera pulvere*a, parasites of, 233.
- Holcremna macellator cothurnata*, notes, 837.
- Home economics—
 education, suggestions for, 142.
 in secondary schools, buildings and equipment, 302.
- Homemakers, rural, use of time by, Mont. 477.
- Homotylus terminalis*, parasite of coccinellid, 73.
- Homozygosis and inbreeding, 507.
- Honey—
 color, notes, N.Y.Cornell 72.
 fermentation, causes, 386.
 low diastase content, Calif. 71.
 rate of ripening, 87.
 use in ice cream, Calif. 98.
- Hookworms—
 in children, improved diets for, Fla. 303.
 N-butylidene chloride test for, 106.
- Hop downy mildew—
 control, 375.
 in British Columbia, 223.
 in 1932, 815.
- Hop powdery mildew, studies, 222.
- Hoplocampa testudinea* control, dusting for, 561.
- Hoplochaitophorus*, new genus, erection, 388.
- Hormone—
 action following injection of pregnancy urine, external evidence, 342.
 testicular, assay, castrated rats for, 351.
 testicular, effect of freshness of testes and of desiccation of testicular tissue, 352.
 testicular, preparations, assay, 351.
 testicular, response of castrated male rats to injection, 351.
- Hormones—
 and vitamins, relationship, 465.
 gonadotropic ρ -factors, purification and properties, 351.
 gonadotropic, preparation, properties, and filtration, 33.
 gonad-stimulating, absence in blood and urine of patients with pituitary tumor, 350.
- Hormones—Continued.
 gonad-stimulating, in hypophysectomized animals, 350.
 oestrogenic crystalline, properties, 352.
- Horse leech invasion of throat of large domestic animals in Bulgaria, 710.
- Horse nettle, control, Ohio 38.
- Horseflies, Bourgault's trap for, 73.
- Horsefly, black, life history, 243.
- Horses—
 big-team hitches, 875.
 big-team outfits, demonstrating, 405.
 blood, bilirubin in after carbon tetrachloride administration, 710.
 blood groups, 580.
 blood, in health and disease, 578.
 blood, iron percentage, 592.
 blood, new piroplasm found in, 248.
 brain disease, Calif. 104.
 colics, effect of weather, 579.
 extension activities with, 405.
 feeding, N.J. 255.
 genital infections and prenatal diseases, 434.
 heart block in, Adams-Stokes' syndrome, 579.
 infections of fetuses and foals, Ky. 111.
 inheritance of piebald patterns and wall eyes in, 640.
 lethal sex-linked gene in, 640.
 metabolism in, N.H. 406.
 metabolism studies, equipment for, 405.
 parasites affecting, V.I. 585.
 summer sores in, cell proliferation response to sulfydryl on, 111.
 thoracic aorta, necrosis and cicatrix, 580.
 type for Corn Belt farming, 405.
 wild, and hybrids, angles formed by bones of locomotion, 701.
 work, protein requirements, N.Y.Cornell 90.
- Hotbeds—
 electrically heated, use, N.H. 364.
 treatise, 124.
- House flies—
 efficient medium for rearing, 83.
 relative toxicity of trisodium arsenite and arsenious acid to, 244.
- Household—
 budgets in money, time, and energy, standards, 765.
 machinery, electric, current consumption, Ind. 156.
 pests, control, Tenn. 76.
 tasks, energy cost, Wash. 907.
- Howardula phyllotretae* n.sp. description, 695.
- Humans, fasting data, Mo. 95.
- Humidity—
 biological effects on storage of fruit, 538.
 methods of regulation, 233.
 relative, chemical control of, 783.
- Humus formation and decomposition of organic matter, Iowa 16.
- Huntley Field Station work, U.S.D.A. 909.

Hyacinths, periodicity in, shifting, 27.

Hyalopterus—

arundinis, see Plum aphid, mealy.

atrificis, vector of bean mosaic virus, 387.

Hybla maculata n.sp., from Puerto Rico, 72.

Hybrid—

constant, of three species, synthesis of, 508.

tri-generic, of *Zea*, *Tripsacum*, and *Euchlaena*, 345.

Hybridization in red clover, 192.

Hydrangea—

bluing and chlorosis, 823.

flower color, effect of aluminum, N.Y. Cornell 57.

Hydraulic machinery, treatise, 874.

Hydrocarbons, oxidation, 730.

Hydrocephalus, hereditary character in mice, 194.

Hydrocyanic acid gas—

effect on California red scale, 388.

fumigation with sustained and dissipated vacuum, 75.

Hydrofluoric acid in factory smoke, effect on grazing cattle, 578.

Hydrogen, determination in gas mixtures, 171.

Hydrogen-ion phenomena in plants, 26.

Hydrogen peroxide in complex mixtures, determination, 485.

Hydrophobia, see Rabies.

Hydroxylamine, production by reduction of nitrates and nitrites, 165.

Hydroxyproline and proline, indispensability in nutrition, 144.

Hylemyia—

antiqua, see Onion maggot.

cilicrura, see Seed-corn maggot.

Hylobius—

abietis, biology of nutrition in, 233.

pales, notes, 85.

Hymenolepis—

cantaniana, intermediate host of, 267.

carioca, new intermediate hosts for, 268.

Hymenoptera, parasitic, descriptions and notes, 247.

Hypera—

postica, see Alfalfa weevil.

punctata, see Clover leaf weevil.

Hyperaspis 8-notata, predacious on citricola scale, 73.

Hypertrichosis partialis in swine, 432.

Hyphantria cunea, see Webworm, fall.

Hypochloride, efficiency, effect of alkalinity, 708.

Hypochnus sasakii, notes, 225.

Hypoderma bovis, see Cattle grub, northern.

Hyponomeuta malinellus, see Ermine moth.

Hypophyseal and prolan preparations, increased gonadotropic effects, 511.

Hypophysectomy in the ferret, 34.

Hypophyses of rats, experimental studies, 512.

Hypophysis, volume of lobes during pregnancy, 197.

Hyposoter disparis, introduced ichneumonid parasite, 398.

Ice cream—

bacteriological study, Kans. 257.

body and texture, factors affecting, Ind. 854.

chocolate, manufacture, 265.

chocolate, qualities, Mo. 576.

chocolate, studies, Kans. 257.

daily sales in Buffalo, N.Y., N.Y. Cornell 137.

freezers, sterilization, N.Y. State 707.

high in fat content, making, Mass. 705.

Iowa, bacterial standard, Iowa 98.

liquid colors in, source of bacterial contamination, 707.

manufacture, Nebr. 572.

manufacture, feasibility of high aging temperatures in, Mass. 705.

manufacture, theory and practice, treatise, 707.

mix, bacteria in, effect of pasteurization temperature, Kans. 257.

mix properties, effect of prolonged holding at pasteurizing temperature, 419.

mix, testing for butterfat, Kans. 257.

nut, sandiness in, Mo. 420.

overrun and quality, effect of source of butterfat, 707.

pin point bacteria in, types and sources, Iowa 98.

plants, milk products used in, N.Y. Cornell 137.

sanitary control, 709.

serving temperature, 855.

strawberry, retention of vitamin C in, Mass. 747.

texture and quality, Ind. 98.

texture, effect of fast freezing, Calif. 98.

texture, microscopic study, 419.

use of stabilizers, Kans. 257.

Iceerya purchasi, see Cottony-cushion scale.

Ichneumon flies, new, descriptions, 561.

Ichthargan, specific against, 587.

Idaho—

Station, notes, 910.

Station publications available for free distribution, 318.

Station, report, 909.

University, notes, 159, 910.

Idiocerus spp. on mangoes, 387.

Illinois—

pisi, see Pea aphid.

solanifolii, see Potato aphid.

Illinois Station work, purpose and benefits, 766.

Immigrant tide in New England agriculture, 139.

Immunology of parasitic infections, treatise, 577.

Import quota system in Germany, 443.

Inbreeding and homozygosis, 507.
 Inbreeding and recombination, 507.
 Incubation, electrical, effect of current interruption in, Calif. 255.
 Index numbers of prices, N.Y.Cornell 127.
 Index numbers of production, prices, and income, Ohio 128, 600, 880.
 Index veterinarius, notes, 320.
 Indiana—
 Station, Moses Fell Annex Farm, report, 909.
 Station, notes, 159.
 Station, report, 157.
 Indian-meal moth, larval growth, 556.
 Industry, supercentrifuge in, 323.
 Infant foods—
 digestion by pepsin in vitro, 890.
 powdered, bacteriological examination, methods, 264.
 Infants—*see also* Children.
 blood, hemoglobin content, Wis. 890.
 feeding, effect of type of milk curd, Calif. 98.
 feeding, soybean milk for, 305.
 nutrition problems and feeding, 890.
 vitamin A treatment, 900.
 Inheritance, *see* Heredity.
 Inoculation, effect on yield and quality of soybeans, Iowa 515.
 Insect—
 behavior, treatise, 382.
 conditions in Canada in 1930, 547.
 conditions in 1932 and effect of mild winter, 685.
 pest correspondence, 1931-32, tabulation, Mont. 232.
 pests, ecological studies, relation to distribution and abundance, 231.
 populations, determining, 831.
 populations, effect of climatic conditions, 382.
 populations, fluctuation, 233, 558.
 populations, new method for collecting samples, 825.
 visitors of fruit blossoms, 76.
 Insecticide—
 gases, toxic action, evaluation, 233.
 new contact, 233.
 Insecticides—*See also* Sprays and specific forms.
 analyses, Me. 520.
 and analyses, directory of manufacturers, 685.
 comparative toxicity, 73.
 composition, Conn.State 234.
 contact, efficiency, factors affecting, 235.
 contact, incorporation with fungicides, 817.
 for European corn borer, 832.
 from nicotine derivatives, Hawaii 683.
 from species of Fabaceae, chemical relationship, 683.
 new contact, development, N.H. 385.
 of plant source, 383.

Insecticides—Continued.

soil, method of rapid application, 685.
 tests against wireworms, Conn.State 550.

Insects—*see also* Entomology.

acceleration of development by parasitism, 545.
 and micro-climates, 634.
 and pests in Scotland, 686.
 aquatic and semi-aquatic, parasites from eggs, 247.
 attacking roots of staple crops, Kans. 232.
 coloration and relative acceptability to birds, 383.
 control, machinery and fire for, Calif. 116.
 control, relation to agricultural machinery, 826.
 control, tests of materials for, Mass. 686.
 economic, in Australia, 686.
 economic, in Mauritius, 686.
 economic, in Tanganyika, 234.
 effect of radiant energy on, N.Y.Cornell 72.
 fight against, historical information, 383.
 forest, *see* Forest insects.
 growth, progression factor in, 383.
 handbook for Connecticut, Conn.State 231.
 in Puerto Rico in 1930-1931, 72.
 in stored products, fumigation, 385.
 injurious, and climate, Kans. 232.
 injurious in Anatolia, 233.
 injurious in Georgia, 385.
 injurious, in Hawaii, 548.
 injurious, in Kansas, 825.
 injurious, in Kansas for 1931, 232.
 injurious, in Montana, Mont. 232.
 injurious, in Mysore, 234.
 injurious, in Russia, catalogue of literature, 825.
 injurious, in Sierre Leone, 234.
 injurious, in southern Africa, 549.
 injurious, in Straits Settlements and Federated Malay States, 549.
 injurious to crops, *see special crops*.
 internal temperatures, effect of radio waves, 230.
 life history, effect of temperature, 383.
 migrations, 383.
 of British Guiana, 548.
 of Japan, illustrated, 386.
 of largest island in Gatun Lake, 560.
 of Malaya, list of food plants, 76.
 of New Zealand, 549.
 of Province of Quebec, 557.
 of season 1931 in Canada, 547.
 orchard, *see* Orchard insects.
 relation to fruit injuries, 245.
 scale, *see* Scale insects.
 scouting in New Jersey for outbreaks 686.
 senses, 545.

Insects—Continued.

- serious outbreaks in Maine, 685.
- toxicity of mixtures of gases to, 825.
- wood-boring, prevention and control, 551.

Insemination, artificial, of animals, Russian methods, 642.

Insulating board, production from corn-stalks, 120.

Insulation on the farm, 600.

Insurance, agricultural, in Canada, 610.

Insurance of farm families, Mich. 746.

Intelligence in man, inheritance, genetical formula, 32.

International—

Agricultural Mortgage Credit Company, scope and organization, 604.

Association of Dairy and Milk Inspectors, reports, 708.

Intestinal flora of rachitic rats before and after ultraviolet ray treatment, 473.

Intestines of horse, surgical operations on, value, 710.

Investor's stake and his attitude, Mo. 601.

Iodide in blood, food, and urine, determination, 633.

Iodine—

addition to milk, effect on bacterial growth, Ohio 99.

and goiter problem in New Zealand, 315.

in Kentucky soils, 497.

in nutrition in coastal Mid-China, 463.

toxicity for tubercle bacillus cells, 425.

Iowa College, notes, 319, 478.

Iowa Station, notes, 319, 478.

Iowa Station, report, 158.

Ipobracon spp., notes, U.S.D.A. 692.

Ips pini, larval development, 835.

Ips spp., hibernation habits, 73.

Iris—

ascorbic acid from, method of obtaining, 773.

Botrytis rhizome rot, N.Y.Cornell 61.

variety tests, Kans. 210.

Iron—

and chlorophyll in green and chlorotic pear leaves, relation, 637.

and copper and salt mixture for cattle and swine, Fla. 248.

and copper supplements in exclusive milk diet for calves, Ohio 99.

assimilation by tissues of rats, effect of copper sulfate, 616.

availability in cereals, Wis. 890.

catalyzing action of manganese on, N.Y.Cornell 25.

corrosion and colloids, 323.

deficient diets, effect on rats, 698.

in fish, 752.

in liver and liver extracts, 463.

in milk and other biological materials, determination, 493.

in milk, cow's and human, 173.

intraperitoneal injections, effect of nutritional anemia, 904.

Iron—Continued.

loss in cooking broccoli, 615.

necessity for growth of *Lemna minor*, N.Y.Cornell 25.

percentage of horse blood, 592.

reduced, for cultivation of anaerobes, 866.

relation to tyrosinase, 486.

sulfate, effect on citrus rots, 676.

yeast, and cytochrome, 632.

Irons, electric, current consumption, Ind. 156.

Irradiation—see also Ultraviolet.

effect on calcium and phosphorus utilization, 406.

Irrigation—

and drainage districts, financial rehabilitation, Ariz. 720.

canvas hose system, 873.

District, Merced, incomes and expenses on properties, Calif. 293, 881.

districts, refinancing, 444.

effect on soil fertility, Idaho 871.

experiments—see also special crops.

Oreg. 437.

practice and engineering, treatise, 720.

projects, Federal, payment of construction costs, 442.

pump, studies, Nebr. 596.

residues, stream pollution by, 117.

rotations under, Nebr. 512.

studies, Calif. 16; N.Mex. 282.

water, annual charges in upper San Joaquin Valley, 452.

water, cost in California, 451.

Iso-hemagglutinogens in rabbits, inheritance, 509.

Ivy bacterial leaf spot, N.Y.Cornell 61.

Ixodes—

ricinus, see Castor bean tick.

sculptus, life history and habits, 697.

Japanese beetle—

control in rose greenhouses, 83.

glucose content, changes in, 695.

in Connecticut, Conn.State 546.

in 1932, economic status, 245.

in Virginia, 386.

pathogenic nematode of, 266.

studies, Mich. 83.

toxicity of castor-bean plant to, 73.

traps, Coleoptera captured in, 73.

traps, liquid bait tests, 245.

Jenkins laboratory, dedication, Conn.State 318.

Jerusalem-artichokes, tests, Oreg. 354.

John's disease—

control, 108, 273.

diagnosis, 108.

in experimentally infected herd, 428.

pathology, 856.

Johnson grass, control by chlorate sprays, Kans. 200.

Jointworm flies, distribution and damage in Utah, Utah 837.

Jordan, W. H., tribute to, Me. 477.

June beetles—

- importance in Michigan, Mich. 559.
- notes, Wis. 825.

Jute and cotton as bale covering materials, comparison, U.S.D.A. 514.

Jute, flower and pollen, development, 794.

Kafir, mutation in, 28.

Kahweol, preparation and properties, 167.

Kainite for killing poison ivy, N.H. 651.

Kakothrips robustus, studies, 549.

Kale, marrow stem, feeding value, 257.

Kaloterms minor, association with fungi, 553.

Kansas College, notes, 319, 622, 910.

Kansas Station, notes, 622, 910.

Kansas Station, report, 317.

Kentucky Station, notes, 159.

Keratin molecule, constitution, 315.

Keratitis ulcerosa in dogs, 579.

Kerosene—

- and coal tar emulsion, use as insecticide, 825.
- cook stoves, performance, Nebr. 156.
- on pyrethrum powders, extractive efficiency, 74.

Ketones of blood and urine of livestock, 715.

Ketosis—

- and nitrogen and water balance studies, significance in obesity diets, 895.
- during fasting in Eskimos, 464.

Kidney worm, swine, resistance of eggs and larvae, 590.

Kidneys of cattle, so-called melanosis of, 579.

Kitchen—

- arrangement studies by photo-electric eye, 765.
- tasks, time spent on, Ind. 156.

Kitten, two-faced, account, 641.

Klebsiella paralytica, causative organism of new moose disease, 110.

Kohlrabi—

- Fusarium* resistance in, inheritance, 813.
- resistance to yellows, inheritance, Wis. 810.

Kraals, infectivity, 420.

Lac insect, parasites of moth enemy, 233.

Lac Research Institute, Indian, report, 384.

Lacoptera chinensis, biology and control, 559.

Lachnochaitophorus—

- bisselli* n.g. and n.sp., notes, 388.
- querceus* n.g. and n.sp., notes, 388.

Lactation—

- dietary requirements, 618; Ark. 760.
- mineral metabolism in, 755.

Lactic acid, production in hemolytic streptococcus cultures, 487.

Lactobacillus—

- acidophilus*, chemistry, 167.
- acidophilus*, viability in sherbet, 265.
- thermophilus*, studies, 262.

Lakes, Minnesota, conditions, relation to fish food productiveness, Minn. 544.

Lamachus pini caledonicus, notes, 837.

Lamb—

dysentery bacillus, single-cell cultures, 589.

dysentery, *Clostridium welchii* from, 859.

quality and palatability, Nebr. 562.

Lambs—

California spring, crossbreeding studies, 565.

cripples in, 275, 276.

cull, causes, Ind. 89.

docking instruments, comparison, N.Y. Cornell 90.

early spring, feeding tests and carcass studies, Nebr. 91.

fattening, Calif. 88; Mich. 700; N.Mex. 249; N.Y.Cornell 90; Wyo. 92.

fattening, corn preparation with alfalfa and silage, Iowa 565.

fattening, roughages for, Ohio 90.

feeder, comparison, Pa. 842.

feeding experiments, 406; Kans. 701; Nebr. 562.

male, effect of castration and docking on gains and carcasses, N.Y.Cornell 90.

market grades, 406.

market, production from aged western ewes, Nebr. 562.

pulpy kidney in, 276.

range, fattening, Idaho 253; Kans. 249.

self-feeding, method, 406.

stiff, relation to feeding and management, N.Y.Cornell 90.

suckling, grain requirements, Ind. 89.

Land—

assessed value, tax delinquency, and school enrollment in rural areas, N.Y.Cornell 127.

classification and types of Michigan, Mich. 778.

credit, *see* Agricultural credit.

digestible nutrients from, with Sudan grass and alfalfa, Calif. 97.

dry, rotation and tillage studies, Nebr. 512.

economic survey of Washburn County, Wis. 881.

foreclosed, and farm debt problem, Mo. 601.

grant colleges, *see* Agricultural colleges.

grants, Spanish and Mexican, effect on California agriculture, 442.

meadow-hay, fertilizer experiments, 39.

problems and agrarian reforms in different countries, 601.

recreational and forestry uses in Massachusetts, Mass. 291.

settlement problems, Federal and State programs, U.S.D.A. 737.

Use Conference of New Jersey, proceedings, N.J. 451.

Land—Continued.

- use, First Missouri Conference, proceedings, Mo. 601.
- use, local, studies, 451.
- use, papers on, 443.
- use symposium, proceedings, 601.

Lands—*see also* Farm land.

- farm, trends in use, Mich. 600.
- marginal, and land inventory, Mo. 601.
- of high and low yield, proportion, 600.
- public, and resources in United States, treatise, 451.
- rural, classification for assessment in western North Dakota, 448.

Landward movement, new, 443.

Laphygma—

- exigua*, *see* Army worm, beet.
- frugiperda*, *see* Army worm, fall.

Larch—

- beetle, eastern, larval development, 835.
- insects, identification by feeding habits, 551.

Lard—

- exports from United States, 1920–32, Ohio 600.
- thiocyanogen number and application, Minn. 318.

Laryngotracheitis—

- in fowls, immunization, 279.
- infectious, control, 861, 862; Mass. 709.
- infectious, immunology, Mass. 862.
- infectious, vaccine for immunizing poultry, 160.
- infectious, virus, desiccation and preservation, 424.
- studies, Calif. 104.
- virus, susceptibility of cloacal tissue to, 435.

Lasioderma serricorne, *see* Tobacco beetle.*Lasius niger neoniger*, notes, Ohio 72.*Laspeyresia*—

- caryana*, *see* Hickory shuck worm.
- molesta*, *see* Fruit moth, oriental.

Latania scale, insecticides for control, Calif. 71.

Lawngrasses, fertilizer experiments, Alaska 47.

Lawns, seeding and care, Conn.State 157.

Lawns, studies, Kans. 200.

Laxation, form of stool as criterion, 750.

Lead—

- arsenate in spray mixtures, effect of different soaps, 74.
- compounds, toxicity for sheep, 580.
- in spray residues, qualitative detection, 493.

Leaf area studies, rapid blueprinting for, 799.

Leaf miner, serpentine, on onions, 233.

Leaf-footed bug, notes, Fla. 231.

Leafhopper—

- blunt-nosed, relation to cranberry false blossom, N.J. 377.
- sharp-nosed, injury to apples, 77.
- six-spotted, salivary glands and alimentary tract, studies, 386.

Leafhopper—Continued.

- six-spotted, transmission of aster yellows by, 386.

Leafhoppers—*see also* special hosts.

- food plants, 238.

Leather, beetles injurious to, 695.

Leaves—

- after spraying, mineral oil retained by, 12.
- green and etiolated, manganese in, 755.

Lecanium kunoensis, parasite of, biology, 246.

Legume bug, proposed name. Idaho 828.

Legume inoculants, inspection, N.J. 363.

Legume seeds, microphotography, 363.

Legumes—*see also* Green manure and Alfalfa, Clover, *etc.*

- accomplishments of station with, Alaska 36.
- as forage crops, Wash. 790.
- carbon dioxide and elemental nitrogen assimilation in, relation, 183.
- comparison for soil building, Iowa 16.
- for green manure, tests, Iowa 38.
- for hay and pasture, Iowa 37.
- forage, variety tests, Oreg. 354.
- in rotations, value, U.S.D.A. 789.
- inoculation—*see also* Nodule bacteria. notes, Mo. 202.
- value of commercial cultures, Iowa 16.
- wet and dry methods, Ohio 513.
- nitrogen compounds effused from root nodules, use by nonlegumes, 781.
- pasture, chemical composition, 405.
- residual values, 320, 793.
- small-seeded, nurse crops for, Iowa 38.
- tests, Hawaii 643.
- v. nonlegume crops, effect on microbiological activities in soil, 502.
- variety tests, Fla. 199; Kans. 200; V.I. 512.

- winter, date-of-planting and turning under, Fla. 199.
- winter, in crop rotations, Fla. 199.
- yield and dependability, Okla.Panhandle 790.

Leis conformis, introduction and study, Fla. 231.*Lema oryzae*, morphology and ecology, 560.*Lemna minor*, iron requirement for growth, N.Y. Cornell 25.

Lemon juice—

- indophenol reducing capacity, relation to vitamin C activity, 327.
- phenolindophenol reducing capacity, nonspecificity, 9.
- reducing substance in, reversibility of oxidation of, 8.
- reducing substance, relation to vitamin C, 7, 8.
- vitamin C preparation from, 774.

Lemon mal secco disease, 540.

Lemons—

- Eureka, pruning, effect, 660.
- mutations in, 28.

- Lentinus tigrinus* growth, effect of temperature, 680.
- Leuzites sepiaria* growth, effect of temperature, 680.
- Lepidosaphes*—
 beckii, see Purple scale.
 gloveri, see Glover's scale.
- Leptinotarsa decemlineata*, see Potato beetle, Colorado.
- Leptocoris trivittatus*, see Boxelder bug.
- Leptoglossus phyllopus*, see Leaf-footed bug.
- Leptomastidea abnormis*, parasite of citrus mealybug, 829.
- Leskiomima jaynesi*, notes, U.S.D.A. 692.
- Lespedeza*—
 in agriculture, 320.
 Korean, hard seed in, 359.
 Korean, seed size, relation to germination and hard seed, 360.
 varieties, adaptation studies, Ind. 37.
 variety tests, Ga.Coastal Plain 37.
- Lettuce—
 arsenical residues on, Conn.State 209.
 boron requirements, 366.
 bottom rot, control, N.Y.Cornell 61.
 breeding, R.I. 210.
 downy mildew, notes, Mass. 663; N.Y. Cornell 61.
 effect of length of day, 652.
 effect of rye and oat straws, 183.
 Florida, decline in production, cause, Fla. 50.
 grading, packing, and stowing, Fla. 50.
 head, variety tests, Hawaii 643.
 improvement, Calif. 48; Mass. 652.
 New York, strain tests, Conn.State 209.
 tipburn, notes, N.Y.Cornell 61.
- Leucemia in fowls, 595.
- Leucocyte count—
 and differentiation with Prym's hemocytometer, 579.
 effect of vitamin deficiency, 617.
- Leucocytozoon anatis*—
 cytology and control, 267.
 in ducks, life history, 281.
 life history, 267.
- Leucosis of fowls—
 notes, 280, 710.
 spontaneous, pathology, 595.
 transmissible, susceptibility, relation to age, breed, and species, 113.
- Leukemia of fowls, 711.
- Levulose, fermentation products, Iowa 3.
- Life insurance companies, farm mortgage experience, S.Dak. 446.
- Light—see also Sunlight.
 effect on hardening process in alfalfa, 354.
 red, effect on antirachitic substances in poultry rations, Me. 410.
- Lightning protection of distribution systems and transformers, 728.
- Ligniera vascularum*, life history, 534.
- Lilac graft blight, studies, 378.
- Lilacs, treatise, 524.
- Lilies, diseases, N.Y.Cornell 61.
- Lima beans, see Beans, lima.
- Limax flavus* eggs, hatchability, effect of dehydration, 382.
- Lime—see also Calcium and Liming.
 analyses, N.J. 24.
 effect on sheep on calcium deficient ration, 564.
 effect on soil micro-organisms, 184.
 for spraying purposes, Mich. 520.
 hydrated, limestone, and dolomite, availability, 503.
 nitrogen, see Calcium cyanamide.
 products, inspection, Mass. 25.
 requirements of soils, see Soils.
 resources of Kenya Colony, 341.
 status, assessing, use of *p*-nitrophenol for, 490.
 value on loam soils, N.C. 341.
- Lime (fruit)—
 juice, fresh, antiscorbutic value, 904.
 sour, canker and gummosis on, 373.
- Limes, vitamin C in, 310.
- Limestone—
 degrees of fineness, effect, Iowa 16.
 dolomite, and hydrated lime, availability, 503.
 effect on orchard vegetation, Ohio 49.
 ground, for fattening cattle, 405.
 ground, value of coarser particles, Ohio 38.
 impurities and agricultural value, Ohio 17.
 powdered, drilling, 439.
- Lime-sulfur—
 and new types of sulfur spray, comparison, Wis. 810.
 dips, 421.
 for gooseberry mildew, cause of defoliation, 228.
 injury, effect of casein spreader, 685.
 spray, evaluation for apple scab, N.Y. State 377.
 test for apple scab control, 821.
- Liming—see also Lime and special crops.
 and soil acidity, R.I. 178.
 effect on reaction and relation to availability of phosphorus fertilizers, Wis. 791.
 effect on yield and quality of soybeans, Iowa 515.
- Limnaea limosa*, chironomid parasite of, 683.
- Limnaea viatrix*, intermediate host of liver fluke, 270.
- Limothrips cerealium*, life history, habits, and enemies, 553.
- Linebreeding, meaning, Iowa 507.
- Linguatula rhinaria*, pathological changes caused by, 579.
- Linkage—
 between blood-group genes and other genes of rabbits, 195.
 relations of a second brown midrib gene in corn, 29.
- Linseed—
 meal v. alfalfa seed screenings for dairy cows, Idaho 848.

Linseed—Continued.

oil, sulfonated, for protection of orchards against rodents, making, 229.

Liparis dispar, bionomics and external structures, 690.

Lipase, microbial, activity, copper soap formation as test, 325.

Liquid particles, small, spontaneous dispersion, 323.

Liquids, spreading on solid surfaces, 284.

Listroderes obliquus, see Vegetable weevil.

Litchi, culture experiments, Hawaii 652.

Liver—

and liver extracts, iron and copper in, 463.

autolyzed, in treatment of pernicious anemia, 314.

fluke, intermediate host of, 270.

function test in sheep, 109.

growth factors in, 899.

hemoglobin regenerating potency, 473.

v. whole wheat and bran for hemoglobin regeneration, 145.

Liverworts as vegetative pioneers on volcanic ash, 336.

Livestock—see also Animals, Mammals, Cattle, Sheep, etc.

and meat industry of Union of South Africa, 450.

breeders, public aid for, 405.

breeding practices, Iowa 89.

diseases, see Animal diseases and specific diseases.

feeding, calcium and phosphorus supplement requirements, 406.

feeding values of grains, comparison, 840.

insurance in Canada, 610.

Kansas, marketing, time and places, Kans. 288.

marketing associations, decline in, Kans. 288.

marketing by motor truck, Mich. 741.

marketing procedure, local, variation in, Ind. 136.

mosquitoes fatal to, 82.

nutritive requirements, 405.

of Virginia, marketing costs, Va. 884.

pasturing experiments, U.S.D.A. 839.

poisoning—see also Plants, poisonous, and specific plants.

from *Senecio* spp., 272.

production on Newlands project, Nev. 612.

production, textbook, 141.

records of performance, value to meat industry, 405.

returns, effect of farm practices, Mich. 130.

statistics, see Agricultural statistics.

Livetin, basic amino acids, 632.

Living—

in our homes, textbook, 303.

standard of, see Standard.

Livistona chinensis, insect noxious to, 690.

Lixophaga—

diatraeae, biology, 244.

diatraeae, parasite of sugarcane borer, 556.

variabilis, notes, 692.

Lizards, Idaho, stomach contents, analyses, 230.

Locust, black—

brooding disease, transmissibility, 679.

value in erosion prevention, Iowa 58.

Locusta migratoria migratorioides, sodium fluosilicate for, 238.

Locusts—

desert, in Egypt, 688.

in Uganda, 549.

Rocky Mountain, phases and synonymy, 687.

Loganberry anther and stigma blight, 821.

Logging—

in "Inland Empire" region, U.S.D.A. 809.

methods in redwood and pine regions, Calif. 59.

operations on spruce-fir land, losses from, Mich. 59.

Longan, culture experiments, Hawaii 652.

Longistigma caryae, notes, Fla. 231.

Lophodermium pinastri on first year seedlings of Scotch pine, recovery from, 679.

Lophyrus pini—

morphology, anatomy, and biology, 233.

parasites of, 837.

Louisiana Station, notes, 767, 911.

Louping ill virus, transmission to voles, 712.

Loxostege sticticalis, see Webworm, beet.

Lubrication of tractor engines, 731.

Lucern, see Alfalfa.

Lucilia sericata—

development and control, 717.

enzyme from, which digests collagen, 559.

nutrition, 394.

olfactory response, 557.

sterile maggots, production, 267.

Lumber—see also Timber and Wood.

softwood, specific gravity and related properties, U.S.D.A. 218.

Lung fluke of mammals, life history, 266.

Lungworm, swine, transmission to dogs, 267.

Lungworms —

bursate, of livestock, 865.

infesting fur bearers, identification, 544.

mechanical removal from foxes, 105.

Luperina stipata, notes, Iowa 71.

Lupinine, toxicity against mosquito larvae, 242.

Lycophotia margaritosa saucia, see Cutworm, variegated.

Lyctus linearis, notes, 233.

Lydella nigripes and *L. piniariae*, bionomics and comparison, 833.

Lye solution as disinfectant in abortion control, 107.

- Lye solutions, germicidal efficiency, relation to temperature, 106.
- Lygidea mendax*, see Apple redbug.
- Lygus*—
- elisus*, notes, Idaho 824.
 - hesperus*, notes, Idaho 824.
 - pabulinus*, notes, 73.
 - pratensis*, see Tarnished plant bug.
 - simonyi*, control, 551.
 - spp., pests of beans, Idaho 828.
- Lymphadenitis, caseous, studies, 589.
- Lymphangitis, ulcerous, of equines, 592.
- Lysimeter studies, 179, 635; Conn.State 178; Oreg. 437.
- Macadamia nuts, quality and culture, Hawaii 652.
- Machinery, see Agricultural machinery.
- Macrocentrus ancylivorus*—
- breeding from reared hosts, 246.
 - notes, Conn.State 546; Mich. 561.
- Macrodactylus subspinosus*, see Rose chafers.
- Macrophoma* sp., notes, 526.
- Macrophoma theae*, notes, 526.
- Macrophomina phaseoli*—
- notes, 373.
 - parasitism and physiology, 527.
- Macropsis*—
- Nearctic species, 238.
 - trimaculata*, transmission of peach yellows by, 386.
- Macrosiphum*—
- ambrosia*, vector of bean mosaic virus, 387.
 - gei*, notes, 239.
 - solanifolii*, see Potato aphid.
- Mad itch—
- and pseudorabies, identity of viruses causing, 266.
 - notes, 860.
- Maggots, sterile, production for surgical use, 267.
- Magnesia requirements of tobacco, Conn. State 518.
- Magnesium—
- and manganese, effect, R.I. 178.
 - very small quantities in biological material, determination, 173.
- Magpies, faunae of nests in Montana, 382.
- Maine—
- Station, notes, 622.
 - Station, report, 477.
 - University, notes, 767.
- Maize, see Corn.
- Mal de caderas of cattle in Paraguay, 273.
- Mal secco of lemons in Sicily, 372.
- Malacosoma americana*, see Tent caterpillar, eastern.
- Malaria—see also Mosquitoes and Anophelines.
- avian, behavior in fowls, 267.
 - avian, host feeding, relation to parasite reproduction in, 266.
 - avian, pathological changes of spleen in, 579.
 - avian, transmission by *Culex pipiens*, 243.
- Malaria—Continued.
- control, automatic distribution of paris green for, 242.
 - control with petroleum oils, 393.
- Malic acid, inactive, in fruits and products, determination, 494.
- Mallein injections in horses, agglutination reaction due to, 434.
- Mallophaga of domestic animals, 580.
- Malta fever, see Undulant fever.
- Mamey, vitamin A in, 617.
- Mammalogy, economic, treatise, 381.
- Mammals—See also Animals and specific kinds.
- of Missouri, 543.
 - reproductive processes, 35.
- Mammary—
- development and function, N.Y.Cornell 36.
 - gland of male and female mice, normal development, Mo. 349.
- Mammitis, see Mastitis.
- Man, cytological abnormality in, 193.
- Man, inheritance of taste deficiency in, 509.
- Manamar, value for growth and milk production, Ohio 99.
- Manganese—
- and magnesium, effect, R.I. 178.
 - effect on cobalt polycythemia, 754.
 - estimation, new and simplified colorimeter for, 330.
 - in fish, 752.
 - in food and biological material, bibliography, 752.
 - in green and etiolated leaves, comparison, 755.
 - in milk, 415.
 - relation to plant growth, N.Y.Cornell 25.
- Mangels—
- for livestock, culture and harvesting, U.S.D.A. 354.
 - v. corn silage for milk production, W.Va. 848.
 - variety tests, 201; Oreg. 354.
 - yield, statistical examination, 647.
- Mango blossom blight in Philippines, 387.
- Mangoes—
- carotene in, 151.
 - fertilizer experiments, P.R. 798.
 - vitamin C in, 310.
 - vitamins in, 307.
- Manioc, see Cassava.
- Mannitol, isolation and identification from *Aspergillus fischeri*, 166.
- Mannose, copper reduction values, 174.
- Mantis, new oriental, in United States, 238.
- Manure—
- artificial, humification by hydrogen peroxide, 185.
 - in rotations, value, Ind. 37; U.S.D.A. 789.
 - substitution of green manures for, R.I. 178.

- Maples in Wooster Arboretum, list, Ohio 217.
- Marasmius sacchari*, parasitism, 535.
- Mares, British, milk from, composition, 409.
- Margarine from standpoint of colloid chemistry, 324.
- Marine borers, resistance of Netherland East Indian timbers to, 247.
- Market—
 exclusion in United States, practice and theory, 443.
 reports, U.S.D.A. 139, 296, 458, 612, 744.
- Marketing—*see also special products.*
 agricultural, in India, 455.
 cooperative, by large-scale wheat producers, Kans. 287.
 methods and practices, Kans. 288.
 prospects for the future in South Africa, 450.
 roadside, by Ohio farmers, Ohio 455.
 textbook, 459.
- Markets, roadside, retail sales, Ohio 127.
- Marmoniella vitripennis*, notes, 382.
- Marssonina*—
kriegeriana and *M. salicicola*, comparison, 542.
salicicola and *M. kriegeriana*, comparison, 542.
- Maruca testulalis*, notes, P.R., 825.
- Maryland—
 Station, notes, 911.
 Station, report, 766.
 University, notes, 911.
- Massachusetts—
 College, notes, 319.
 Station, Field A experiments, Mass. 23.
 Station, report, 766.
- Mastitis—
 acute, type of inflammation, relation to milk properties, 586.
 and udder infections, Idaho 865.
 bovine, filter-passing strain of *Streptococcus* from, 430.
 bovine, studies, 274.
 catarrhal, in cows, 855.
 caused by several micro-organisms, Wis. 865.
 control, 715.
 detection, paper test for, Ind. 857.
 diagnosis by leucocyte content of milk, 857.
 effect of various treatments, 108.
 experimental, 429, 586, 714.
 laboratory detection, N.Y.State 715.
 of sheep, two enzootic forms, 717.
 relation to human infection, 586.
 streptococcic—
 cause and symptoms, nature, 583.
 diagnosis by seroagglutination, 587.
 of cows, 579, 580.
 studies, 715.
- Materials of construction, *see* Building.
- Matter, rubber-like and liquid-crystalline states, 323.
- May beetles, distribution in Michigan, 834.
- Meadows—*see also* Grasses, Grassland, and Pastures.
 top-dressing, Mass. 643.
- Mealybug—
 citrus, natural control, 829.
 citrus, notes, 547.
 grape, notes, 547.
 pineapple, cause of pineapple wilt, 829.
 pineapple, new gall midge affecting, 693.
 pineapple, on pineapple fruit, effects, 385.
- Measles, intensive vitamin therapy in, 151.
- Meat—*See also* Beef, Pork, etc.
 distribution and consumption, 444.
 export trade, development, 450.
 marketing procedure, local, variation in, Ind. 136.
 of grass-fat cattle, factors affecting, Kans. 248.
 production, distribution, and consumption, 406.
 scraps, protein analyses, Calif. 88.
 tenderness, 615.
- Meconopsis downy mildew, notes, 678.
- Media, *see* Culture media.
- Mediterranean fever, *see* Undulant fever.
- Meiosis, studies, 194.
- Melanconium sacchari*, parasite or saprophyte, 534.
- Melanocallis caryaefoliae*—
 identity, 239.
 notes, Fla. 231.
- Melanoplus*—
mexicanus, notes, Iowa 72.
mexicanus, phases and synonymy, 687.
spretus, *see* Locusts, Rocky mountain.
- Meloe variegatus*, effect on bees, 395.
- Melon aphid, vector of bean mosaic virus, 387.
- Melon sick soil, substitute crops for, Iowa 48.
- Melons—
 breeding and selection of resistant strains, Iowa 60.
 wilt resistant types, morphology and cytology, Iowa 48.
- Men, inheritance of hemophilia, 508.
- Menhaden oil, feeding value for swine, Ga. 248.
- Meningo-encephalitis of sheep in New Zealand, 858.
- Menstruation in monkeys following ovariectomy, 36.
- Mercury in food and biological material, bibliography, 752.
- Merodon equestris*, *see* Narcissus bulb fly.
- Meromyza americana*, *see* Wheat stem maggot.
- Merulius lacrymans*—
 and *Coniophora cerebella* in mixed cultures, biology, 680.
 in timber of buildings, development, effect of fillers, 680.
- Mesothemis simplicicollis*, predacious on *Tabanus* spp., 243.

Metabolism—

- basal, cost of work in relation to, 465.
- basal, of children of retarded growth, standards, 750.
- basal, standards for predicting, 750.
- of women during reproductive cycle, 751.

Metals—

- corrosion in salt solutions and seawater, 724.
- in food and biological material, bibliography, 148, 752.
- thin films on, properties, 323.

Metamasius sericeus, see Cane weevil, silky.

Metastrongylus elongatus, notes, 267.

Metaxenia and xenia in apples, 29.

Meteorological observations, Fla. 317; Mass. 177, 332; Me. 477; Ohio 13; Oreg. 477; U.S.D.A. 176, 177, 776, 909; V.I. 621.

Meteorology—see also Climate, Rainfall, Temperature, Weather, etc.

- agricultural, bibliography, 13.
- agricultural, in India, 160.
- papers on, U.S.D.A. 176, 177, 332, 776.

Meteorus autographae, notes, 398.

Methanol, freezing and flow points for, 122.

Methionine—

- metabolism, 145.
- role in animal organism, 617.

Methoxyl in food plants, 494.

Methyl anabasine, toxicity against mosquito larvae, 242.

Methylene blue, photodynamic action on viruses, 272.

Methylglyoxal formation by *Clostridium acetobutylicum*, 166.

Mettriona bivittata, biology and control, 84.

Mice—

- affecting watermelons, Fla. 231.
- albino, protein requirements, 144.
- autosomal recessive coat form character in, 510.
- birth weight, morphogenetic relation to mature body weight, 193, 194.
- female, sexual maturity in, 196.
- field, breeding, factors affecting, 32.
- lactating, effect of pregnancy urine injection, 196.
- tail mutations in, preliminary symbols, 510.

Michigan—

- College, notes, 622.
- Station, notes, 622.
- Station, quarterly bulletin, 158, 621.

Microanalysis, quantitative organic, 170.

Microbracon—

- hebetor*, notes, U.S.D.A. 691.
- hebetor*, vector of an insect disease, 247.
- mellitor*, notes, 696.

Microclimatology, 495.

Micrococcus ovis, two enzootic forms, 717.

Microdontomerus anthonomi, notes, 696.

Microlepidoptera, Indian, life histories, 392.

Micro-organisms—see also Bacteria and Organisms.

- causing rancidity and taint in butter, Iowa 98.
- effect of fertilizers and soil treatments, Iowa 16.
- effect of lime, 184.
- in soil under various fertilizer treatments, 502.
- use in production of odors attractive to the dried fruit beetle, 233.

Microplitis croceipes, notes, 242.

Microstroma tonellianum, notes, 228.

Midges, bloodsucking, studies, 243.

Miescher's tubules of bovines in Switzerland, 715.

Mildew—see also host plants.

- in cotton goods, fungi causing, 374.

Milk—

- activated, role in rickets prevention, 153, 154.
- analysis, methods, 708.
- and milk preparations, copper in, 463.
- and milk products, food value, 709.
- antirachitic, production, 709.
- as sole diet for calves, Kans. 257.
- bacterial counts in, papers on, 708.
- bacterial counts, yeast extract medium for, Mich. 573.
- bacterial or cell counts, effect of drying off cows, 850.
- bleaching and cardboard flavor, 417.
- cardboard flavor in, cause and control, Conn.Storrs 572.
- certified, nutritional quality developments in, 709.
- certified, relation to market milk, 708.
- coagulated evaporated, *Bacillus coagulans* in, 416.
- composition, effect of amount of protein fed, Ohio 99, 101.
- composition, effect of foot-and-mouth disease, 578.
- condensed sweetened, causes for thickening, Wis. 848.
- consumption, daily, in April of different years, Mass. 737.
- contamination from metal surfaces, agar disc method of study, Iowa 574.
- control, papers on, 708, 709.
- coolers, internal-tube, value, Calif. 98.
- cooling equipment, N.Y.Cornell 116.
- cooling on farm, 706.
- creaming, 708.
- curd, type, effect in infant feeding, Calif. 98.
- deficient in solids-not-fat, 415.
- dry storage, effect, N.H. 417.
- effect of agitation before separation, 851.
- evaporated, unusual type of coagulation in, Iowa 98.
- foam, effect on dairy calves, S.Dak. 100.
- freshly drawn, streptococci in, 855.

Milk—Continued.

- freshly drawn, streptococci or cells in, relation to fibrotic tissue in udder, 428.
- from individual farms, pasteurization, bacterial efficiencies, Iowa 98.
- from streptococci-infected cows, evaluation for sanitary regulations, 579, 580.
- germicidal property, Iowa 98.
- heat coagulation, 260.
- high-grade, bacterial flora before and after pasteurization, W.Va. 706.
- homogenization, Pa. 851.
- human and cow's, iron in, 173.
- human and cow's, vitamin C in, 309.
- in England and Wales, reorganization commission, report, 457.
- inspectors, international association, 708.
- iron in, determination, 493.
- iron-copper diet, effect of prolonged feeding to rats, 753.
- irradiated—
 - biochemical studies, 417.
 - factors affecting antirachitic potency, 154.
 - value, Wis. 839.
- liquid and condensed, for chicks, Ind. 89.
- loose, health hazard, 262.
- manganese in, 415.
- manner of freezing, 259.
- market, sources in Ohio, Ohio 742.
- marketing costs in Laconia, N.H. 445.
- marketing through ice cream, N.Y.Cornell 137.
- methylene blue and sediment tests, comparison, 709.
- mineralized, effect on growth, Wis. 839.
- nutritive properties, effect of pasteurization, 304, 851; Ohio 102.
- nutritive properties, effect of protein feeding, Ohio 99, 101.
- of five dairy breeds, relative digestibility, 463.
- of various breeds, vitamin A in, Nebr. 572.
- off flavors in, Calif. 97.
- partially frozen, centrifugal separation, 260.
- partially frozen, thawing and sampling, 260.
- pasteurization—
 - control, coli-aerogenes determination, 262.
 - Electropure process, effect on bacterial endospores, 416.
 - factors affecting efficiency, 851.
 - high short v. low long holding, 706.
 - high-temperature, short-time pasteurizer and holder process, N.Y.State 416.
 - papers on, 708, 709.

Milk—Continued.

- pasteurization—continued.
 - relation to nutritive properties, 304, 851; Ohio 102.
- peroxidase, preparation, properties, and action, 485.
- physical properties, effect on rate of digestion, Iowa 98.
- plant practice and equipment, 708, 709.
- plants, operation and management, U.S.D.A. 138.
- plants, pasteurization efficiency and subsequent contamination, Iowa 98.
- powders, bacteriological studies, 264; Mass. 712.
- production—
 - and utilization in Maine, Me. 445.
 - effect of nutrition, Nebr. 572.
 - effect of plane of feeding, U.S.D.A. 848.
 - effect of temperature and humidity, Calif. 97.
 - sanitary, 709.
 - statistical data, R.I. 288.
 - temporary and permanent pastures for, value, Conn.Storrs 572
 - under basic rating plan, seasonal variation, Vt. 882.
- products, calcium and phosphorus in, utilization, Kans. 304.
- products, dried, alkaline water blanks for plating, 264.
- properties, effects of freezing, Md. 574.
- proteins, biological values, 896.
- pumps, types, efficiency and capacity, Calif. 98.
- quality, Coolege test for, application of yeast extract to, Mich. 102, 103.
- rancid flavors in, 850.
- raw and pasteurized, *Bacillus coli* in, 262.
- raw v. pasteurized, nutritive value, 709; Ohio 99.
- ropy, causes and correction, 709.
- samples, proportional, 850.
- secretion in goats, stimulation, N.Y. Cornell 36.
- selection for homogenization, reliability of sediment test, Mich. 573.
- skimmed, *see* Skim milk.
- soft-curd, studies, Utah 892; Wis. 848.
- supplies in small communities, improving, 709.
- tallowiness in, biological factors, Ill. 417.
- titratable acidity, 709.
- vitamin A in, effect of heating, 466.
- vitamin C in, effect of rations, Kans. 257.
- vitamin D in, Mich. 574.
- vitamin D in, increasing, N.J. 705; Ohio 99.
- vitamins in, effect of yeast feeding, Ohio 99.

- Milk—Continued.
 yield and fat test, effect of mechanical grooming machines, Conn.Storrs 572.
 yield, effect of arsenical dipping of cows, 258.
 zinc in, 415.
- Milking—
 hand, methods, 415.
 machines—
 operation and installation, Calif. 97.
 sterilization, lye v. chlorine for, Kans. 257.
 tests, Idaho 848.
 washing, efficient and cheap method, Wis. 848.
 washing, methods, Ind. 98.
- Millet—
 diseases, control methods, 222.
 Italian, inheritance of floral structures called bristles, 784.
 seeds, microphotography, 363.
 variety tests, Fla. 199; N.Mex. 200.
- Milo—
 disease, now, Kans. 222.
 dry-land production, Nebr. 790.
 production, variable practice in, Okla. Panhandle 514.
 value of cover crops for, Calif. 37.
- Mineola*—
juglandis, see Walnut case bearer.
vaccinii, see Cranberry fruit worm.
- Mineral—
 balance studies on poultry, 570.
 constituents, absorption from insoluble compounds by plants, 188.
 feeds, studies, Oreg. 252.
 metabolism during pregnancy and lactation, 755.
 mixtures, calcium determination in, 489.
 nutrition of plants, 188.
 oil, effect on color of egg yolks, Wis. 839.
 requirements of pregnant sows, 255.
 supplement requirements of farm animals, 406.
 supplements for sheep, effect on blood, 105.
- Minerals—
 colloidal, paper on, 323.
 feeding to range cattle, 405; N.Mex. 249.
 function in nutrition, 406.
 in pasture grasses of North Wales, 644.
 in pastures, intensively treated, 251.
 in soil, effect on quality of onion scales, N.Y.Cornell 51.
 role in growth and disease resistance, 464.
- Minks, distemper in, 596.
- Minnesota Station, notes, 159, 622, 911.
 Minnesota Station, report, 318.
 Minnesota University, notes, 911.
 Mint flea beetle, notes, Ind. 71.
 Mississippi Station, notes, 622.
- Missouri Station, notes, 622.
 Missouri Station, State Fruit, report, 621.
 Missouri University, notes, 622.
- Mites—
 infesting raspberries, control, 247.
 injurious to privet, Md. 686.
 notes, Fla. 231.
- Mitosis and meiosis in diploid and triploid Asiatic cotton, 638.
- Mohair industry in South Africa, 450.
- Molasses—
 as fertilizer, 516.
 butanol, acetone, and ethanol production from, P.R. 771.
 effect on production and reproduction of dairy cows, Hawaii 698.
 for chicks, Hawaii 698.
 for pigs, Ohio 90.
 v. beet pulp for milk production, P.R. 849.
- Mold—
 fungi, growth, inhibitory action of certain substances, 373.
 growth in bread, Minn. 462.
 products, results of research, Wis. 771.
- Molds, classification, treatise, 189.
- Mollusks—
 chironomid parasite of, 683.
 edible, of Manila, 303.
- Monetary—
 inflation, Iowa 603.
 reform, relation to farm relief, Okla. 288.
- Moniezia expansa*—
 eggs, studies, 267.
 of cattle and goats, status, P.R. 105.
- Monkeys, immature, effect of pituitary extracts, 350.
- Monocrepidius lividus* larva, prothetely in, 396.
- Monodontus trigonocephalus*, notes, 590.
- Mononchus* sp., notes, 229.
- Monoses, commoner, glucoside formation in, 166.
- Montana College, notes, 319, 623.
- Montana Station, notes, 319, 623.
- Moon and weather forecasting, 13.
- Moon blindness, etiology, 579.
- Moose disease, new, cause, 110.
- Moose, diseases affecting, Minn. 431.
- Morodora armata*—
 n.g. and n.sp., description, 398.
 notes, 382.
- Mortars and cement, colloidal nature and properties, 323.
- Mosaic diseases, plants susceptible to, 527.
- Moscow Mountain Experimental Forest, notes, 159.
- Mosquito repellents for cattle on pasture; Alaska 88.
- Mosquitoes—see also *Anopheles*, Malaria, and Yellow fever.
 adaptation of larvae to salt water, 393.
 anopheline, in southern Rhodesia, 392.
 as vectors of equine encephalomyelitis, 434.
 biology, 234.

Mosquitoes—Continued.

- breeding, effect of water reaction, 392.
- breeding places, hydrodynamics of, 392.
- control in Connecticut, Conn.State 546.
- control in Delaware, Del. 81.
- control in Uganda, 549.
- culicine, relative toxicity of larvicides, 242.
- culicine, susceptibility to bird malaria, 243.
- engorging culicine, effect of light, 243.
- fatal to livestock, 82.
- in Canada during 1931, 547.
- relation to human welfare, 243.
- survey, Del. 71.

Moths—see also Clothes moths.

- house and clothes, life history, habits, and control, 391.
- of South Africa, 557.
- of three families, life histories, 392.

Motor—

- fuel, alcohol-gasoline mixture, Idaho 871.
- fuels, technical aspects, 876.
- oil, worn-out, use for San Jose scale control, 232.
- oils, examination, Me. 437.
- truck marketing of Michigan livestock, Mich. 741.

Motors, farm, V-belt drives for, Idaho 285.

Mountain lions, trapping U.S.D.A. 381.

Mouse, waltzing, case of superfetation in, 641.

Moving pictures of plant movements and development, 188.

Muck crops, irrigation, Ohio 49.

Muck soils, pasture studies on, Fla. 199.

Muck soils, studies, N.Y.Cornell 16.

Mucor botryoides, notes, U.S.D.A. 692.

Muffins without wheat, 892.

Mules—

- brain disease, Calif. 104.
- immunization with formalized horse sickness virus, 420.
- parasites affecting, V.I. 585.

Multiple partition coefficient, theory of penetration, 187.

Mung beans, types in India, 795.

Murgantia histrionica, see Harlequin bug.

Murrina of equines, transmission experiments with bats, 592, 712.

Musca domestica, see House flies.

Muscidae of New Zealand, biology and economic status, 244.

Muscular exercise—

- long-continued, effect on cattle tissues, 700.
- nature of foods as source of energy in, 464.

Mushroom beds, nematode as disease agent, 375.

Muskmelon—

- diseases, Del. 60.
- downy mildew, notes, Ga. 221, 668; Ga.Coastal Plain 60.

Muskmelon—Continued.

Fusarium wilt in Minnesota, U.S.D.A. 669.

powdery mildew, notes, Calif. 60.

Muskmelons—

- culture and marketing, Ill. 51.
- value of cover crops for, Calif. 37.

Muskrats—

- habits, Md. 681.
- in Germany, 70.

Mutation—

- called "waved" in hair of young mice, 510.
- hairless, in rats, 194.
- in dwarf banana, 29.
- in sorghum, 28.
- recurrent, role in evolution, 190.
- short-tailed, in mice, lethal action in, 348.
- thread-leafed, in tomato, genetics, 29.

Mutations—

- fruit, in horticultural plants, 28.
- in deciduous fruits, 799.
- produced by electromagnetic induction and X-rays, 28.
- rate, breeding methods for determining, 640.
- tail, in mice, preliminary symbols, 510.

Mycological nomenclature, 372.

Mycorrhiza, relation to tree growth, 343.

Mycorrhizas of trees and shrubs, 637.

Mycosis in chicks, severe outbreak, 113.

Mycosphaerella pinodes, notes, 526.Myiasis in sheep due to *Lucilia sericata*, 717.

Myosalvarsan in horse and rabbit, elimination and decomposition, 710.

Myxobacteriaceae, morphology any cytology, 372.

Myzocallis fumipennellus, see Pecan aphid, black.

Myzus—

- cerasi*, see Cherry aphid, black.
- persicae*, see Peach aphid, green.
- persicae-niger*, see Peach aphid, black.
- pseudosolani*, notes, 239.

Nails, roofing, development and use, 287.

Nanophyetus salmincola, pathogenicity of metacercariae for fish hosts, 267.

Naphthalene—

- as fumigant against peach borer and sod insects, 830.
- as fumigant for clothes moths, 237.
- as fumigant for greenhouse insect pests, Mass. 686.
- dust for control of apple sawfly, 561.
- for carrot rust fly, tests, N.Y.Cornell 72.
- for midge larvae in tobacco seed beds, 232.
- for onion thrips, control, 76.

Narcissus—

- bulb diseases, control, Fla. 221.
- bulb fly, biology and control, 243.
- bulbs, sterilization, 823.
- bulbs, vapor heat treatment for pest control, 687.

Narcissus—Continued.

dwarfing and malformation, 69.

mosaic and fire, N.Y.Cornell 61.

Narcotine and vitamin C, relation, 9, 10, 772.

Nasal granuloma or schistosomiasis in cattle, 715, 858.

National parks of United States, fauna, 681.

Nebraska Station, report, 621.

Necrobacillosis in a horse, 434.

Necrobia rufipes, see Ham beetle, red-legged.

Necrology, notes, 768.

Nectarines, varieties and species, classification, N.J. 368.

Nectria coccinea and beech scale, 232.

Nematode—

as carrier of disease in mushroom beds, 375.

parasite, new, of ducks, description, 437.

Nematodes—see also Root knot nematode. affecting peas, Ariz. 65.

affecting watermelons, Fla. 231.

associated with cotton soreshin, U.S. D.A. 670.

bulb, tests of chemicals lethal for, 811.

control on narcissus bulbs, 823.

effect of hexylresorcinol, 272.

from bobwhites in Ohio, 268.

in greenhouse soils, eradication, Mass. 663.

notes, Calif. 71.

occurrence in this country, 544.

of British fallow deer, 105.

of genus *Heterodera*, 542.

on Hawaiian pineapples, effect of soil temperature, 822.

on potatoes, importance to production in England, 534.

on potatoes, relation to fungoid diseases, 533.

on sugarcane roots in Hawaii, 535.

parasitic in alimentary tract of sheep, 590.

trichostrongylid, from sheep in Kenya, 590.

Nematodirus—

spathiger, notes, 590.

triangularis, notes, 382.

Nematospira phaseoli, notes, 689.

Nemeritis canescens, biology, 233.

Neoplectana glaseri, notes, 266.

Neodiprion—

abietis, see Spruce sawfly.

n.spp. in forests of Canada, 561.

vallicola on pines in Mexico, 561.

Neoplasms in federally inspected establishments, 868.

Neosalvarsan in horse and rabbit, elimination and decomposition, 710.

Neotermes castaneus, notes, Fla. 231.

Nepticula braunella n.sp., description and biology, 242.

Nervous system of rats, effect of vitamin A deficient diet, 311.

Neuritis in swine, 860.

Neurospora crosses, inheritance of albinistic nonconidial characters, 372.

Nevada Station, notes, 319, 478.

Nevada Station, report, 158.

New Hampshire—

College, notes, 767.

Station, notes, 911.

Station, report, 477.

New Jersey College, notes, 160.

New Jersey Stations, notes, 160, 623, 911.

New Mexico—

College, notes, 479, 623.

Station, notes, 479.

Station, report, 318.

New York—

Cornell Station, report, 158.

State Station, notes, 768.

Newcastle disease of poultry in Victoria, 595.

Nezara viridula, see Stinkbug, southern green.

Nickel in food and biological material, bibliography, 752.

Nicotiana—

hybrids, embryo development in, 345.

spp. hybrids, pollen abortion in, 30.

suaveolens, poisonous to sheep, 580.

tabacum, inheritance in, 191.

tabacum, triploid in, behavior, 639.

Nicotine—

fixation, new development in, 683.

insecticide from, Hawaii 683.

poisoning by absorption through skin, 581.

sulfate, effect on cranberry fruit worm, Mass. 687.

sulfate v. anabasine sulfate, toxicity for aphids and leafhoppers, Conn.State 546.

tannate for control of onion thrips, N.Mex. 232.

toxicity against mosquito larvae, 242.

Nitrate of soda, see Sodium nitrate.

Nitrates—

accumulation, unusual in 1931, Ohio 17.

and vegetable crops, R.I. 178.

assimilation in soils, Iowa 16.

hydroxylamine as reduction product, 165.

in soil, effect of crop residue decay, 636.

studies, Mass. 635; Oreg. 354.

Nitrification—

effect of *Bacillus mycoides*, 779.

effect of legume or nonlegume crops, 502.

in Iowa soils, Iowa 16.

Nitrites, hydroxylamine as reduction product, 165.

Nitrogen—

absorption from culture solutions, 500, 501.

accumulation in soil, effect of cropping system, 499.

ammoniacal, in fertilizers, determination without distillation, 491.

Nitrogen—Continued.

- ammonium and nitrate, for cotton plants, comparison, Ga. 199.
- assimilation by grasses and clovers, Mass. 643.
- changes in stored alcoholic extracts of plant tissues, 492.
- effect on grassland herbage, 251.
- fertilization, effect, 185.
- fertilizers, fifty years of experiments with, Mass. 23.
- fixation—
 - by legumes, effect of carbon dioxide, Wis. 776.
 - by micro-organisms, 500.
 - by nonsymbiotic micro-organisms, Iowa 16.
 - effect of copper, manganese, and iron, Del. 16.
 - in six soil types, Mich. 23.
 - legumes v. nonlegumes, Mass. 635.
- fixing bacteria in soil, determination of number, Ohio 17.
- in gas mixtures, determination, 171.
- in phosphate rock, 487.
- in wheat during growth, 637.
- metabolism of plants, 188.
- movement and translocation in profile of podzolic soil, 635.
- movement in soil, 184.
- utilization of women during reproductive cycle, 751.

Nitrogenous—

- exchange of rats, measurements, 896.
- fertilizers on *Molinia* pasture, comparison, 644.

Nitrophoska, effect on tobacco, Conn.State 518.

Nodular worms of cattle, status, P.R. 105.

Nodule bacteria—*see also* Legumes, inoculation.

- available information, Wis. 776.

- organic nitrogen from, effect on non-legumes, 781.

Nonlegumes, inoculation, value of commercial cultures, Iowa 16.

Norleucine, isolation from spinal cord protein, 166.

Nosema apis, tenacity, 838.

Novius cardinalis, population study of biological control, 233.

Nucleic acids, irradiation, 169.

Nursery—

- diseases, control, Iowa 60.
- inspection, Conn.State 546.
- planter, three-row, for space and drill planting, 599.
- stock, transportation in United States and Canada, regulations, Conn.State 157.

Nut diseases, control by new method, U.S.D.A. 652.

Nut industry, trend toward higher quality production, U.S.D.A. 652.

Nutcracker, Siberian, and crop of cedar nuts, 543.

Nutrient media, *see* Culture media.

Nutrition—

- animal, *see* Animal nutrition.
- for superior growth, 143.
- laboratory, reports, 142.
- plant, *see* Plant nutrition.
- proline and hydroxyproline in, 144.
- relation to dicarboxylic amino acids, 144.
- research at White House conference on child health and protection, 144.
- studies, 890.
- studies, use of statistical methods, 405.

Nuttalia—

- equi*, notes, 592.
- minor* n.sp., new blood parasite of horses, 248.

Oak—

- forests, growth and yield, Pa. 808.
- Nuttall's, weight of fruit, 218.
- posts, preservative treatments, tests, Ark. 874.
- scale and parasite, 388.
- species, *coccifera*, germination and seedling development, 525.
- trees, young, effect of illuminating gas, 507.

Oaks, comparative radial growth, 218.

Oat—

- crown rust, physiological specialization and parasitism, Iowa 60.
- crown rust-resistant strains, Iowa 60.
- diseases, control methods, 222.
- smut control, formaldehyde dust in, Wis. 810.
- smut, notes, Kans. 221.
- smuts, biology, 666.
- smuts, hybridization and segregation in, Minn. 222.
- smuts, resistance of hybrids to, 663.
- straw, effect on vegetables, 183.

Oats—

- acre values, Minn. 201.
- as sole ration for horses, 405.
- as substitute for bran and middlings for chicks, Ind. 89.
- asynaptic dwarf, meiosis in, 783.
- breeding, Ga. 199; Ind. 37; Iowa 37; Kans. 200; N.Y.Cornell 38; Nebr. 512; Oreg. 354.
- culture experiments, Ga.Coastal Plain 37.
- cutting with binder or mower, Alaska 36.
- digestion trials with pigs, 567.
- dry-land production, Nebr. 789.
- effect of lime, green manure, and superphosphate, Ga.Coastal Plain 37.
- feeding value compared with other grains, 840.
- feeding value for sheep and lambs, Ind. 89.
- fertilizer experiments, Fla. 199; Ga. Coastal Plain 37; Nebr. 512.
- for grain and hay, Oreg. 354.
- for grazing of pigs, Fla. 248.
- for hay, tests, Alaska 36.
- for silage, tests, Alaska 36.

Oats—Continued.

germinated, for laying birds, Del. 89.
germination after years of storage, 363.

grinding for pigs, Ohio 90.

in culture solutions, nitrogen absorption from, 500.

Iowa's commercial, destination and origin, Iowa 126.

methods of feeding to pigs on pasture, Ohio 90.

natural crossing, 644.

Navarro, 205.

rotation and tillage experiments, U.S.D.A. 789.

rotation experiments, U.S.D.A. 789.

solution cultures, experiments, 636.

sprouted, effect on cattle and swine, Hawaii 697.

stored, respiration, relation to moisture, Iowa 38.

unhulled, v. oat feed for layers, Ohio 90.

varieties—

comparison, effect of rate of seedling, 204.

new, adaptation studies, Ind. 37.
on peat and sandy lands, Minn. 201.

regional adaptation, U.S.D.A. 644.

variety tests, 201; Alaska 36; Ga. Coastal Plain 37; Idaho 788; Ind. 789; Iowa 37; Kans. 200; Me. 353; N.Mex. 200; Nebr. 512; U.S.D.A. 789.

variety-cultural experiments, Iowa 37.
wild, natural crossing, 360.

Oesophagodontus robustus, N-butylidene chloride for, 106.

Ocsophagostomum—

columbianum larvae, longevity and nodular formation by, Ohio 104.

columbianum, notes, 590.

longicaudum, development in pigs, 267, 432.

of Primates, host list, new species and new subgenus, 545.

venulosum, notes, 431.

Oestrin—

chemistry and biological assay, advances in, 511.

effect on gonad-stimulating complex in hypophyses of castrated rats, 34.

hypophyseal antagonism in rats, studies, 34.

Oestrogenic hormones, crystalline, properties, 352.

Oestrous cycle in ewes, effect of nutrition, 406.

Oestrum-exciting compounds, synthetic, 352.

Oestrus ovis, see Sheep botfly.

Offal products, artificially dried and pressed, feeding value, 258.

Office of Experiment Stations, notes, 624.

Ohio State University, notes, 623.

Ohio Station, report, 158,

Oides decempunctata on grapes, 84.

Oidium leaf disease of rubber, 379.

Oidium sp., notes, 373.

Oil—

barren nontoxic, in coal tar creosote, 665.

cakes, artificially dried and pressed, feeding value, 258.

emulsion-cresylic acid sprays, compatibility with fungicides, 684.

emulsions, insecticidal, casein ammonia as emulsifying agent, 826.

lubricating, sprays in Ontario, status, 548.

palms, caterpillar pests on, control, 76.

sprays and tank mixture methods, Calif. 71.

sprays, miscible, preparation from lubricating oils, Mass. 686.

sprays, preparation, 73; Oreg. 73.

sprays, studies, Mass. 686; Oreg. 384.

Oils—see also Fats and specific oils.

automotive, lubricating values, 876.

fuel, commercial standard, 729.

paraffin v. asphalt base, preservative efficiencies for stored eggs, 704.

petroleum spray, evaporation under field conditions, 685.

Okra tests, V.I. 520.

Okra, vitamin A in, 617.

Oleic acid, use as emulsifier, 73.

Oligonychus ulmi, control, 73.

Olive wet root rot disease, notes, 526.

Olives—

oil content, decrease on pickling, Calif. 3.

spoilage, prevention, Calif. 3.

Onchocerca—

cervicalis, embryology, Kans. 266.

flexuosa from antelope and deer, 268.

gutterosa from cervical ligament of cattle, 268.

Oncideres cingulatus, see Twig girdler.

Onion—

bulb rot and yellow dwarf, Iowa 60.

bulb rots, survey, Wis. 810.

downy mildew, studies, N.Y.Cornell 224.

insects, biology and control, Iowa 71.

maggot, control, N.Y.Cornell 72.

maggot infestations in light and heavy soils, 547.

maggot, notes, 548; Ind. 71; Ohio 72.

mildew, origin and control, 815.

pink root, notes, Calif. 60.

scales, color and thickness, effect of mineral elements, N.Y.Cornell 51.

thrips, biology and control, 553.

thrips, control, Mass. 686; N.Mex. 232.

thrips, naphthalene for control, 76.

thrips, utilization of carbohydrates and proteins by, N.Y.Cornell 72.

thrips, varietal resistance of plants to, 71.

yellow dwarf, transmission by aphids, 828.

yellow dwarf, vectors, Iowa 71.

Onions—

- attacked by bulb nematode, N.Y.Cornell 61.
- breeding experiments, Mass. 652.
- disease resistance in, role of catechol in pigmented scales, 533.
- effect of rye and oat straws, 183.
- fertilizer experiments, Ga.Coastal Plain 48; Mass. 652.
- fertilizer, irrigation, and breeding tests, N.Mex. 210.
- growth, effect of pH, N.Y.Cornell 366.
- spraying, use of larger tractors in, Wis. 825.
- Sweet Spanish, number of seed stalks, factors affecting, 798.
- tests, V.I. 520.
- varieties, Ohio 49.
- yield and qualities, factors affecting, N.Mex. 282.

Onthophagus spp., new intermediate hosts for *Hymenolepis carioca*, 268.

Ooencyrtus—

- johnsoni*, notes, 77.
- kuvanae* and *Anastatus disparis*, interrelations, 86.

Oogenesis of mice, cytoplasmic inclusions and nucleolar phenomena, 350.

Oospora scabies, see Potato scab.

Oospora sp. as potential agent of root rot, 672.

Ophiobolus—

- graminis* and certain micro-organisms, growth reaction, 811.
- miyabeanus* culture medium, effect on another fungus, 25.
- miyabeanus*, internal infection of rice seeds, 66.
- oryzinus*, cause of rice disease in Arkansas, 671.
- spp., diseases in cereals caused by, 374.

Opihi, vitamins A and D in, Hawaii 747.

Opius crawfordi, notes, U.S.D.A. 82.

Opius melleus, biology, 85.

Optic nerve and retina in dogs, hypoplasia, 580.

Orange—

- canker, notes, 526.
- juice and slices, canned, vitamin C in, 309.
- juice, canning, possibilities and limitations in, 615.
- juice, fresh, vitamin C in, 309.
- juice, preservation in frozen storage, Calif. 143.
- maggot, see Mexican fruit worm.
- mold decay, prevention, 677.
- scale, forms, comparison, Calif. 555.
- scale, variation in population density in hilly lemon grove, 829.
- trees, effect of lead arsenate insecticides, U.S.D.A. 73.
- trees, young, starch in, 806.

Oranges—

- fertilizer experiments, P.R. 798.
- mutations in, 28.

Oranges—Continued.

- Satsuma, fertilizer and rootstock requirements, Fla. 209.
- seedless, selections in Puerto Rico, 524.
- thinning in California, effects, 806.
- vitamin C in, 310.

Orchard—

- heaters, Calif. 116.
- heaters, loss of oil while standing, 522.
- insects in 1931, 384.
- insects in northern Illinois, 385.
- inspection, see Nursery inspection.
- management, Oreg. 364.
- sites, selection as to soil fertility and frost pockets, Mich. 522.
- soil management, Nebr. 520.
- soils, phosphorus distribution and acidity, Ohio 21.
- studies, Kans. 209.

Orchards—see also Fruits, Apples, Peaches, etc.

- dusting experiments, Ohio 49.
- fertilization, Idaho 798.
- management, N.Mex. 799.
- soil management, Ind. 48; N.Y.Cornell 53.
- tile drainage in, Ohio 874.
- winter spraying, 73.

Orchid embryos, utilization of leucine, glyc-
erine, and aspartic acid by, N.Y.Cornell
25.

Oregon Station and substations, reports,
477.

Organic—

- compounds, structure, relation to in-
hibiting effect on liver esterase, 168.
- materials, base exchange in, 182.
- matter—

- composition, effect on rate of de-
composition, 496.
- formation from forest, range, and
pasture growths, Fla. 178.
- in phosphate rock, 487.
- in soil, importance, 496.
- movement and translocation in
profile of podzolic soil, 635.
- poorly decayed, effect on plant
growth, 183.

- nutrients, digestion coefficients, 406.

Organisms—see also Bacteria and Micro-
organisms.

- important in dairy products, classifi-
cation, Iowa 98.

Orgilus longiceps n.sp., description, 399.

Oriental fruit moth, see Fruit moth, ori-
ental.

Oriental moth in Massachusetts and intro-
duced parasite, 78.

Orius insidiosus—

- notes, 242.
- tricolor*, notes, Calif. 827.

Ornamental plants, shrubs, and trees, see
Plants, Shrubs, and Trees.

Orthaga mangiferae n.sp., description, 388.

Orthogonality and confounding principles
in replicated experiments, 36.

- Orthoptera, hibernation—
and diapause in, 77.
in, physiological changes during, 76.
- Oryzanin, isolation from rice polishings, 6.
- Osmotic pressure, colloid, in small quantities of fluids, 488.
- Osteitis fibrosa in dogs, 711.
- Osteomalacia in grazing cattle, cause, 578.
- Osteomyelitis—
sterile blowfly larvae for, food requirements, 394.
treatment with blowfly larvae, U.S.D.A. 83.
- Ostertagia*—
circumcincta, notes, 431.
occidentalis, notes, 431.
orientalis n.sp., notes, 431.
pinnata n.sp., description, 590.
spp., notes, 590.
- Otiorynchus ligustici*, new to United States, 685.
- Outcrossing in columbine, 216.
- Outlook statements, accuracy and timeliness, Idaho 131.
- Ova of rats in fallopian tubes, viability, 642.
- Ovariectomy, effect on menstruation in monkeys, 36.
- Ovary, human, development from birth to sexual maturity, 349.
- Ovary of sexually immature monkey, luteinization, 642.
- Ovens, gas and electric, comparison, Ind. 156.
- Ovulation—
search for neurological mechanisms in, 787.
spontaneous, in monkeys, 196.
- Ox suprarenal, antiscorbutic activity, 904.
- Oxidase activity, effect of pH value, 26.
- Oxidation-reduction systems, rate of autoxidation and relation to free energy, 170.
- Oxygen—
absorption in soils, 338.
determination in blood sample, 172.
in gas mixtures, determination, 171.
inhalation and injection, therapeutic value, 579.
- Oxyuris equi*, N-butylidene chloride for, 106.
- Paederus fuscipes*, notes, 695.
- Pahute weed, feeding value, Calif. 37.
- Paint and varnish products, colloidal phenomena in, 324.
- Paint and varnish removers, colloidal aspects, 324.
- Palms, oil, see Oil palms.
- Panolis flammea*, notes, 233.
- Pansies, effect of electric light supplementing daylight, Ind. 49.
- Papaipema nebris*, notes, Iowa 71.
- Papayas—
culture experiments, Hawaii 652.
feeding value for poultry, Hawaii 698.
tests, V.I. 520.
- Paper mulch—
effect on vegetables, Nebr. 521.
tests with potatoes, Fla. 199.
- Parafoulbrood, studies, 560.
- Paralysis—
avian, Mass. 709.
chronic progressive bulbar, in horses, 578.
fowl, in chicks under three months of age, 435.
infectious bulbar, see Aujeszky's disease.
of bees, 87.
of fowls, 710; Fla. 265; N.H. 420.
of fowls, diagnosis, 594.
of vestibule of ear of dogs, basis, 711.
range, of fowls, Iowa 104; Ohio 104.
range, of fowls, effect of rations, 719.
- Paraphelenchus maupasi*, notes, 228.
- Parasites—
animal, list, 105.
animal, notes, Kans. 265.
animal, of rats in Canton, China, 544.
Chilean insect, for New Zealand, 549.
external, of South African mammals, birds, and reptiles, 420.
from a bird's nest, 73.
helminth, of rabbits, relation to abundance in Canada, 382.
in domestic animals, microscopic diagnosis, Ill. 105.
in Puerto Rico, status, P.R. 105.
insect, shipping in refrigerated containers, 71.
internal, of sheep, 430.
internal, of swine, 111.
nematode, of goats and sheep at Muktesar, 431.
new mymarid egg, from Haiti and Puerto Rico, descriptions, 72.
worm, in confined and nonconfined chickens, 268.
- Parasitology of domestic animals, treatise, 577.
- Parasitus* spp., predators of bark beetles, 685.
- Paratetranychus indicus* on sorghum, 399.
- Paratheresia claripalpis*, notes, U.S.D.A. 692.
- Parathyroid—
glands of horses, anatomical position, 421.
hormone, effect on calcium and phosphorus metabolism, 311.
- Paratrioxa cockerelli*—
feeding habits, 828.
length of adult life, 685.
notes, 225; N.Mex. 232.
- Paratuberculosis, see Johne's disease.
- Paratylenchus besoekiana* n.sp., notes, 228.
- Paratyphoid—
group from pigs, 421.
infection in the drake, 710.
infection in turkeys, 281.
of pigeons in Rumania, immunization, 582.
- Paratyphoid-like fever in children, 582.
- Paresis, parturient, complicated case, 587.

- Paris green—
 diluted with charcoal, effect on *Culex* larvae, 393.
 for malaria control, automatic distribution, 242.
- Parlatoria pergandei*, see Chaff scale.
- Paroxya clavuliger*, new intermediate host for *Cheilosporira hamulosa*, 268.
- Parrots, diseases liable to be confused with psittacosis, 271.
- Partridge—
 damage law, revision, 384.
 Hungarian, experimental tularemia in, 271.
- Passion fruit, culture experiments, Hawaii 652.
- Pasteurella*—
 and *Brucella* organisms, absence of serological relations, 423.
tularensis, infection of grouse by, 271.
- Pasteurellosis paresis of cattle in Paraguay, 273.
- Pasture—
 crops, yield and composition for bottom land, 354.
 grasses, see Grasses.
 plants, growth, factors affecting, 792.
 plants, palatability, factors affecting, 202.
 plants, vitamin A in, 412.
- Pastures—see also Grasses, Grassland, and Meadows.
 carrying capacities, U.S.D.A. 848.
 control on farms in Finland, 412.
 effect of grazing and fertilizers, Iowa 16.
 for hogs, S.C. 254.
 improvement, Ind. 37; Kans. 200.
 irrigated, effect on growth of Holstein heifers, 412.
 nutritive value, 400.
 permanent, value for fattening pigs, N.C. 843.
 response to fertilizers, Ind. 789.
 studies, Fla. 199; Ga.Coastal Plain 37; Kans. 248, 257; Wis. 791.
 typical North Wales, minerals on, 644.
 yield and composition, effect of intensive fertilization, 404.
- Pathology textbook, 865.
- Pea—
 aphid, notes, Kans. 232.
 aphid, vector of bean mosaic virus, 387.
 diseases in Arizona, Ariz. 65.
 gallfly in Rhine Valley of Switzerland, 549.
 meal as vitamin A supplement for poultry, Idaho 839.
 mildews, notes, Ariz. 65.
 root rot, effect of fertilizers, Wis. 533.
 root rot, notes, Wis. 810.
 thrips in Rhine Valley of Switzerland, 549.
 weevil, notes, Idaho 824.
 wilt fusaria in culture, temperature relations, 65.
 wilt in California, U.S.D.A. 670.
- Pea—Continued.
 wilt, new vascular *Fusarium* disease, 815.
 wilt, relation to soil type, Wis. 533.
 wilt resistance, notes, Md. 663.
- Peach—
 aphid, black, and *Anuraphis amygdali*, comparison, 239.
 aphid, black, and *Brachycaudus amygdali*, comparison, 239.
 aphid, green—
 notes, 239.
 spraying experiments, 689.
 sudden appearance and injury in north Bihar, 388.
 transmission of cucumber mosaic by, 671.
 vector of bean mosaic virus, 387.
 borer, lesser, control, Ohio 78.
 borer, naphthalene as fumigant, 830.
 disease, little, Del. 60.
 inheritance of characters in, 803.
 leaf silver mite, Mich. 550.
 trees, longevity, Ga. 209.
 twig moth, parasites and predators, Calif. 71.
 yellows dissemination by periodical cicada, Del. 60.
 yellows, insect transmission, 386.
- Peaches—
 arsenical injury and control, 658.
 Babcock, new hybrid, Calif. 55.
 breeding, Iowa 48.
 California, supply, demand, and prices, Calif. 294.
 dropping, nature and causes, Del. 48.
 effect of nitrogen from different sources, Del. 48.
- Elberta—
 composition, and fruit bud formation, correlations, 656.
 hardiness studies, N.J. 804.
 leaf area and size of fruit, correlations, 656, 657.
 stomatal behavior and fruit growth, effect of soil moisture, 656.
 fertile Hale, description, Mich. 55.
 fertilizer requirements, N.H. 364.
 fruit bud set, standard for classifying, N.J. 368.
 genetic composition, Mass. 652.
 growth study of fruit, 655.
 harvesting studies, Utah 368.
 Hiley, composition and growth rate, 656.
 J. H. Hale, as parent in peach crosses, 804.
 landscape and windbreak tests, Fla. 209.
 Oriole and Valiant, description, N.Y.State 367.
 Phillips Cling, gumming, 658.
 pollination, W.Va. 212.
 preparing for market, U.S.D.A. 523.
 pruning, Md. 652.

Peaches—Continued.

- refrigerated, physiological changes and tastelessness in, 676.
- seed size, relation to fruit size, 657.
- split pit and gumming, Calif. 47.
- spray schedules for, Mo.Fruit, 654.
- thinning in Illinois peach area, 657.
- varieties and species, classification, N.J. 368.
- variety tests, Ga.Coastal Plain 48.
- winter injury, Ga. 221.

Peacocks, coccidia in, 545.

Peanut—

- bacterial wilt, notes, 533.
- leaf spot, studies, Ga. 221.
- shell meal, nitrification, Mass. 634.

Peanuts—

- breeding, Fla. 199.
- breeding for disease resistance, Ga. 221.
- correlations of branches, flowers, pods, and yield, 784.
- culture experiments, Fla. 199.
- fertilizer experiments, Fla. 199; Ga.Coastal Plain 37.
- for grazing of pigs, Fla. 248.
- production and utilization in South Africa, 450.
- production, approved practices, N.C. 43.
- shelled, advantages of planting, Ga. 221.
- soil amendment studies, Fla. 199.
- variety tests, Fla. 199; Ga.Coastal Plain 37.

Pear—

- industry, status and trends, Mich. 743.
- leaves, green and chlorotic, chlorophyll and iron in, 637.
- thrips, control, irrigation and flooding in, Calif. 71.
- trees, Japanese, new canker disease, 68.

Pears—

- Bartlett, sectorial chimera, somatic segregation in, 786.
- black end, notes, Calif. 60.
- breeding, Iowa 48.
- cork or drought spot in, 820.
- inhibitory substance in, effect on potato growth, Kans. 189.
- irrigation problems and projects, Oreg. 365.
- named seedlings, description, 799.
- new bacterial disease, cause, N.Y. Cornell 61.
- Ovid and Willard, description, N.Y. State 367.
- Poiteau, parthenocarpy, in 654.
- pollination, Calif. 47; Oreg. 364, 365; W.Va. 212.
- production problems, Oreg. 365.
- root growth under different fertility conditions, 654.
- variety tests, Ga.Coastal Plain 48.
- vitamin C in, 310.

Peas—

Austrian winter—

- as cover crop, Ga. 209.
- effect of nonbeneficial nodule bacteria, 519.
- fertilizer experiments, Fla. 199; Ga. 199.
- canned, quality, effect of fertilizers, Wis. 798.
- canned, vitamin C in, stability relation to copper content, 153.
- canning, diseases, Minn. 529.
- canning, new varieties, Wis. 798.
- for silage, tests, Alaska 36.
- from plants affected with root rot, abnormal enlargement, N.Y.State 376.
- harvesting, combine reel for, 123.
- lighter colored, resistance to aphid injury, Wis. 825.
- shelled green, carbohydrate changes in, N.Y.State 343.
- varieties, yield, Me. 364.
- variety on peat land, Minn. 201.
- variety tests, Ga.Coastal Plain 48; Mass. 643; Oreg. 354.
- winter field, culture experiments, Ga. Coastal Plain 37.
- winter field, variety tests, Ga.Coastal Plain 37.

Peat—

- biological decomposition, Mich. 22.
- lands, crop experiments on, Minn. 201.
- lands, subsidence, Calif. 16.
- mats for germination tests of forest tree seeds, 58.
- moss as manure substitute in greenhouse, Ind. 48.
- pH of, factors affecting, 22.
- soils, buffer capacity, N.Y.Cornell 337.
- soils, pasture studies on, Fla. 199.

Pecan—

- aphid, black, identity, 239.
- cigar case bearer, notes, Fla. 231.
- nut case bearer, control and parasites, Fla. 231.
- nuts, composition, effect of fertilization and soil types, Fla. 209.
- orchards, fertilizers and cover crops in, Fla. 209.
- rosette control, progress, 823.
- rosette, studies, Ariz. 379.
- weevil on nut trees, cage for confining, 85.

Pecans—

- cover crop experiments, Ga.Coastal Plain 48.
- food storage and growth in, relation to nitrogen absorption, Fla. 209.
- propagation, Ga. 209.
- rancidity in, prevention, Fla. 303.
- response to soil type and locality, Fla. 209.
- stomatal movements in, 806.
- variety and stock tests, Fla. 209.
- variety tests, Ga.Coastal Plain 48; N.Mex. 210.

Pectic substances, 324.

Pectin—

in fruit juices, decomposition, effect of micro-organisms, Mass. 633.

in Philippine fruits, 748.

properties, Del. 3.

Pectinophora gossypiella, see Bollworm, pink.

Pediculoides ventricosus, see Straw itch mite.

Pejibaye palm, culture experiments, Hawaii 652.

Pellagra studies, 155.

Pellagra-like disorder in rats on diets high in raw egg white, Wis. 890.

Penicillium—

crustaceum as potential agent of root rot, 672.

digitatum and *P. italicum*, antagonism in nature, 664.

digitatum, notes, 676, 677.

group, classification, treatise, 189.

italicum and *P. digitatum*, antagonism in nature, 664.

spp., effect on jellying power of fruit juices, Mass. 633.

spp., effect on oranges in storage, 538.

Pennsylvania—

College, notes, 479, 768, 912.

Station, notes, 479, 912.

Pentastomum denticulatum in cattle, distribution in Russia, 579.

Pentathionic acid, preparation and properties, 383.

Pentatomidae of Cuba, 387.

Peony diseases, Minn. 222.

Pepper—

fruit rots, studies, Ga. 221.

Phytophthora blight, notes, Fla. 221.

Peppers—

chili, wilt, notes, N.Mex. 222.

Florida, grading, packing, and stowing, Fla. 50.

growth, effect of electricity, 877.

improvement by selection, Mass. 652.

pimiento, vitamin A in, 308.

variety tests, Ga.Coastal Plain 48; Minn. 211; R.I. 200.

Periarthritis nodosa of coronary artery in swine, 578.

Peridermium strobili, see White pine blister rust.

Peridroma saucia, see Cutworm, variegated.

Perisierola angulata n.sp., description, 399.

Peritonitis of sheep on Romney Marsh, 716.

Permeability—

and osmotics of plant cell, 187.

and plasmolysis to water, course, 187.

of soils, N.Mex. 180.

studies, 188.

Peronoplasmodium cubensis, notes, P.R. 810.

Peronospora—

arborescens, notes, 678.

destructor, studies, N.Y.Cornell 224.

hyoscyami, life history, U.S.D.A. 67.

Peroxidase, milk, preparation, properties, and action, 485.

Perspiration, insensible, of man, 306.

Pest control, patents relating to, U.S.D.A. 73.

Pestalozzia—

* *palmarum* of coconut, 373.

sp., notes, 526.

Petroleum distillates, most efficient, for pyrethrum extracts, 551.

Phacidium infestans, spread and control on spruce, 380.

Phagocytosis, effect on malarial infections of birds, 267.

Phanerotoma—

buchneri parasite of moth enemy of lac insect, 233.

grapholithae n.sp., description, 399.

Pheasants—

rearing by open range system, 544.

research on, 543.

ring-necked, experimental tularemia in, 271.

Phenyl-mercuric compounds, action on animals and preservative values, 870.

Phlegethontius quinque maculata, see Tobacco worm.

Phlegethontius sexta, see Tomato worm.

Phlox, bulb or stem nematode affecting, 69.

Phoma—

apiicola, notes, 532.

betae, cause of root rot, 672.

destructiva, notes, Fla. 221.

spp., notes, 526.

terrestris, *Allium* spp. resistant to, 670.

Phoma-like fungi, formation of conidia in, 372.

Phomopsis—

citri, notes, Fla. 221.

fukushii n.sp., studies, 68.

spp. on conifers, differentiation, 378.

Phormia regina—

olfactory response, 557.

sterile maggots, production, 267.

Phorocera pumilio n.sp., description, 393.

Phosphate—

compounds in soil, identification, 181.

fixation in soils, nature, 21.

ion and viosterol, comparison for anti-rachitic value, 471.

readily soluble, in soils, studies, 498.

rock, composition and distribution, U.S.D.A. 780.

rock, feeding value, Wis. 839.

rock, fertilizing value, see Phosphates, comparison.

rock, sulfur, organic matter, nitrogen, and water in, 487.

Phosphates—

availability in alkaline calcareous soils, 499.

availability in soil and fertilizers, R.I. 179.

comparison, Ind. 16, 776.

in Kentucky soils, distribution, availability, and nature, 181.

in rice, effect of parboiling and milling, 469.

unavailability in acid soil, Wis. 776.

Phosphatic—

- fertilizers, availability, Ark. 780.
- slag, water solubility, 186.

Phosphoric—

- acid, soil capacity to supply plants, methods for estimation, 328.
- esters in metabolism, significance, 307.

Phosphorus—

- absorption by wheat, effect of pH, 363.
 - and calcium, relation to growth and rachitic leg weakness in chickens, 570.
 - assimilation by barley plants, 186.
 - available, in alkaline calcareous soils, methods for estimating, Colo. 328.
 - available, in Iowa soils, Iowa 16.
 - available, in soils, determination, field methods, 491.
 - calcium relation, effect on growth, calcification, and blood composition of rats, 147.
 - deficiency, factor in experimental rickets, 473.
 - effect on fruit bud formation in apples, N.H. 364.
 - fertility, studies, Wis. 791.
 - from milk and milk products, utilization, Kans. 304.
 - in casein, 11.
 - in citric acid extracts of soils, determination, 174.
 - in corn sap as measure of available soil phosphorus, 20.
 - in wheat during growth, 637.
 - metabolism, effect on parathyroid hormone and irradiated ergosterol, 311.
 - movement in soil, 184.
 - of brain in rickets and tetany, 155.
 - partition in blood of rachitic and non-rachitic calves, 258.
 - readily available, in soils, determination, 329.
 - requirements of legumes, Fla. 199.
 - requirements of soil, Calif. 16.
 - residual effect of heavy applications, Conn.State 178.
 - retention in children, effect of irradiated ergosterol, 312.
 - soluble, in soil, determination, 20.
 - transformations in growing corn plant, 40.
- Photo-electric eye for study of efficiency of household arrangement, 765.
- Photography as aid in examination of feeding stuffs, 775.
- Photoperiodism experiment, Fla. 199.
- Photosynthesis—
- effect of water-logged soils, N.Y.Cornell 53.
 - experiments, induction periods in, 187.
 - in detached leaves, effect of ether and chloroform, 507.
 - in portions of spectrum, 506.
 - of apple leaves, fluctuation in, 213.
 - special air-chamber for studying, 782.

Phycomycetes, notes, 372.

Phyllachora sorghi, notes, 373.*Phyllocoptes* sp., injurious to privet, Md. 686.*Phyllophaga* spp., distribution in Michigan, 834.*Phylloxera vitifoliae*, see Grape phylloxera.*Phymatotrichum*—*omnivorum*—

in plant juices, Tex. 528.

notes, 669; Tex. 532.

persistent strands in Texas, 814.

root rot, resistance of monocotyledons to, Tex. 528.

root rot, resistance of Turk's-cap hibiscus to, Tex. 528.

Phyone, gonadotropic action on immature rabbits, 643.

Physalospora—*cydoniae*, notes, 228.

zeicola on corn, taxonomic and host relations, 669.

Physoderma zeae-maydis, notes, 223; Fla. 221.*Phytalus smithi*, percentage of parasitism by parasites, 686.*Phytomonas*—*citri*, notes, 526.

medicaginis phaseolicola, notes, 812.

medicaginis phaseolicola, varietal susceptibility of beans to, N.Y.Cornell 61.

spp. and *Erwinia amylovora*, comparison, 68.

spp., notes, 223.

tumefaciens on a conifer, 678.

Phytonomus posticus, see Alfalfa weevil.*Phytophaga destructor*, see Hessian fly.*Phytophthora*—*cactorum*, notes, 539.

cactorum on snapdragons, 823.

colocasiae, notes, 373.

distribution of genus, Mo. 528.

erythroseptica, notes, 817.

infestans, see Potato blight, late.

richardiae, notes, 378.

Picrotonic acid, determination, 331.

Pieris brassicae, see Cabbage butterfly.*Pieris rapae*, biology, 239, 690.

Pig houses, movable, plans and construction, N.J. 599.

Pigeonpeas—

breeding, Hawaii 643.

types at Pusa, 795.

variety tests, V.I. 512.

vitamin A in, 617.

Pigs—see also Sows and Swine.

autopsies, Ind. 104.

baby, losses, Kans. 265.

blood picture, relation to anemia, Minn. 93.

born without eye balls, 701.

Chicago prices, trends in, Ind. 89.

condemnation due to retained testicles, Idaho 838.

cost of production, factors affecting, Ill. 881.

Pigs—Continued.

- crossing lard and bacon breeds for production of Wiltshire sides, N.Dak. 568.
- dry lot feeding and grazing, comparison, Fla. 248.
- East African virus disease in, 420.
- fattening on small grains, 405.
- fattening, value of permanent pasture for, 406; N.C. 843.
- feeding experiments, 566, 567; Kans. 248; La. 408; Nebr. 562.
- finishing in dry lot, Ohio 90.
- for types of farming areas, Iowa 126.
- forages for, S.C. 254.
- growing, vitamin requirements, 563.
- hogging-off wheat, Ind. 89.
- Iowa, packer demand for, Iowa 126.
- market preferences for, variations in, 443.
- marketing, seasonal fluctuations in, Iowa 127.
- markets of Pacific coast, potential supply areas, 609.
- nutritive requirements, Kans. 248.
- on pasture, protein supplements for, Mich. 567.
- parasites affecting, V.I. 585.
- production and marketing, farmers' response to prices, U.S.D.A. 739.
- production, trend toward efficiency and quality, U.S.D.A. 697.
- protein supplements for, Del. 88.
- receipts at Oklahoma City market, 1923-32, Okla. 737.
- shrinkage en route to market, Ind. 89.
- shrinkage from farm to market by truck and by rail, Ill. 94.
- situation, Okla. 288.
- situation in the State, Okla. 737.
- suckling, anemia in, 405.
- surface area, determination, 566.
- Pilchard oil as source of vitamin D for chicks, Wash. 845.
- Pimelea pauciflora*, poisonous to sheep, 580.
- Pimpla* spp., notes, 246.
- Pine—see also White pine.
- Aleppo, germination and seedling development, 525.
- Australian, compression wood in, 661.
- beetle, southern, ecology, temperature extremes as factor, 397.
- beetle, western, winter kill in California, 397.
- blue stained wood, in Japan, 680.
- geometrid, epidemiology, 233.
- geometrid parasites, gradation, 233.
- geometrid pupae, identification, 234.
- insects, identification by feeding habits, 551.
- longleaf, root system on deep sands of western Florida, 809.
- noctuid control, role of meteorological observations, 233.
- Norway, plantations, aspen competition in, 217.

Pine—Continued.

- Norway, seedbed conditions in forest, improving, 217.
- posts, preservative treatments, tests, Ark. 874.
- regions, logging methods, Calif. 59.
- sawfly, parasites of, 837.
- Scotch, seedlings infected with *Lophodermium pinastri*, regeneration, 679.
- Scotch, white pine weevil affecting, 245.
- seedlings, effect of soil reaction, 370.
- shoot moth, European, control, Conn. State 231.
- shoot moth, European, in Connecticut, 80.
- shoot moth in Canada, 547.
- spinner, normal food, 233.
- summer wood relationships, 370.
- tree planting trials at North Platte, Nebr. 520.
- trees in Mexico, sawfly affecting, 561.
- Pineapple—
- fruiting, effect of smoke and ethylene, N.Y.Cornell 53.
- leaves, spotting, cause, 829.
- Pineapples—
- accession of seedlings and new forms for future breeding, P.R. 49.
- control of time of blooming, P.R. 49.
- Hawaiian, field soil temperatures, relation to nematodes, 822.
- tests, V.I. 520.
- triploid, morphological and cytological characteristics, 786.
- vitamin C in, 310.
- Pionnotes betae* as potential agent of root rot, 672.
- Pipe culverts, rigid, supporting strength, 723.
- Piricularia oryzae*—
- growth, effect of copper sulfate, 66.
- internal infection of rice seeds, 66.
- notes, 225, 534.
- Piroplasma bigeminum*—
- control, 587.
- immunization against, 588.
- in northern Queensland, 867.
- notes, 718.
- Piroplasma caballi*, notes, 592.
- Piroplasmoses—
- bovine, in North Africa, experimental chemotherapy, 587.
- in Greece, 592.
- Piroplasmosis—
- bovine, in British Columbia, etiology, 588.
- bovine, in Costa Rica, 588.
- equine, treatment, 579.
- of fowls in Greece, 595.
- survey, 866.
- transmission through foot-and-mouth disease serum, 578.
- Pissodes strobi*, see White pine weevil.

Pituitary—

anterior—

acid extract, long continued injections, effects, 350.
and urine of pregnancy, specificity in action, 197.

avian, injection into fowls, effect, 198.

extracts, effect on sexually immature monkeys, 350.

gonadotrope actions, 197.

sex hormone, effect on normal and semicastrated rats, 350.

therapy and uterine motility in rabbits, 643.

implants, homeoplastic, effect on sex characters in fowls, 197.

tumors, effect on gonad-stimulating hormone in blood and urine, 350.

Pityokteines sparsus, larval development, 835.

Placenta, mouse, kyogenic substance in, 196.

Plagioderia versicolora, notes, 232.

Plagiognathus arbustorum, hymenopterous parasite of, 399.

Plague disease of man and rats, international conference on, 229.

Planets and sunspots, relation to weather, 175.

Plant—

behavior, integration, 188.

breeding—*see also* Hybridization and specific plants.

new varieties, methods, 212.

bugs on citrus, pecan, and truck crops, Fla. 231.

cells—*see also* Cells.

activities in, 188.

chromosomes, *see* Chromosomes.

containers, region of root distribution, relation to nutrient factors, Mass. 652.

cuttings, treatment with emulsified paraffin and liquid rubber, Ohio 49.

diseases—*see also* Fungi and different host plants.

and pests, control, Oreg. 364.

atlas, 663.

control, 526; Conn.State 221.

effect of environment, 372.

fungus, treatise, 219.

in Maryland, Md. 663.

in Punjab, 373.

in United States in 1931-32, U.S.D.A. 663.

in winter rainfall area of Cape Province, check list, 526.

manual, 663.

of unusual importance in 1932, Mass. 663.

seed-borne, control by X-rays, 665.

studies, 222; Can. 222.

extracts, toxicity to goldfish, 75.

food materials, reducing capacity, relation to vitamin C, 7.

Plant—Continued.

growth and development, papers on, 188.

growth, effect of ammonium sulfite, 340.

growth, effect of X-rays, 638.

growth in containers, physiology, Mass. 652.

growth in greenhouses, effect of artificial illumination, 878.

growth, relation to manganese, N.Y. Cornell 25.

inspection, *see* Nursery inspection.

juices containing vitamin C, reducing value, 618.

juices, nitrogen in, R.I. 178.

materials, arsenic determination in, 493.

materials, sugar content, effect of storage in alcohol, Ind. 48.

movements and development, moving pictures of, 188.

movements, relation to growth-producing substances, 188.

nutrients, three principal, rate of application, Conn.State 178.

nutrition, studies, Fla. 188.

parasites, relation to bacteriophage, 373.

pests, handbook for Connecticut, Conn. State 231.

physiology, studies, N.Y.Cornell 25.

physiology, textbook, 241.

sap, composition, relation to soil solution, 19.

tissues, alcoholic extracts, nitrogen changes in, 492.

tissues, osmotic value, effect of drought, 25.

tumors, bacterial, and root formation, 811.

virus preparations, standardization and purification technic, 526.

viruses, differentiation and classification, papers on, 372.

viruses, quantitative work with, use of primary lesions in, 672.

weather and climate station, suggestions for, 775.

Plantain—

boiled green, vitamin A in, 617.

narrowleaf, control by chlorate sprays, Kans. 200.

Plants—

aerial parts, absorption of water by, 25.

agricultural, vernalization, 320.

aquatic, treatise, 216.

carbon metabolism, papers on, 187.

Connecticut, quarantine restrictions affecting shipments, Conn.State 157.

cultivation in artificial light, 27.

culture, effect of electricity, 877.

desert, *see* Desert.

difficult and unusual, propagation, Iowa 48.

dispersal throughout world, treatise, 187.

Plants—Continued.

- dwarf, from unafter-ripened embryos of seeds, 26.
 - effect of X-rays, N.Y.Cornell 25.
 - flowering, growth under cloth, Ohio 49.
 - growing, methods for measuring, R.I. 200.
 - hydrogen-ion phenomena in, 26.
 - imported for testing, U.S.D.A. 504.
 - in arid regions, daily water balance, 189.
 - landscape and windbreak tests, Fla. 209.
 - mineral constituents, effect of variations in nutrient media, Ark. 781.
 - monocotyledonous, resistance to *Phymatotrichum* root rot, Tex. 528.
 - nomenclature, treatise, 504.
 - nutrient ions and enzymic activity, 188.
 - ornamental, effect of electric light supplementing daylight, Ind. 49.
 - ornamental flowering, infected with curly top, list, U.S.D.A. 677.
 - ornamental, tests, V.I. 520.
 - periodicity in, shifting, 27.
 - permeability, *see* Permeability.
 - phosphoric acid supply of soils, methods for estimation, 328.
 - photosynthesis, *see* Photosynthesis.
 - poisonous—*see also* Livestock poisoning and specific plants.
 - in North Dakota, N.Dak. 580.
 - in Union of South Africa, toxicity, 421.
 - pollination, *see* Pollination.
 - respiration, *see* Respiration.
 - self-sterility and cross-sterility in, 33.
 - senility in, cause, 26.
 - soil-binding, for reclaiming gullies in the South, U.S.D.A. 59.
 - susceptible to mosaic, list, 527.
 - swelling in and plasmolysis, 187.
 - transpiration, *see* Transpiration.
 - transport of metabolites and salts in, 188.
 - tropical and subtropical agricultural, treatise, 28.
 - upward movement of inorganic solutes in, 342.
 - uronic acids and methoxyl in, 494.
 - varietal resistance to insect attacks, 71.
 - viruses, classification, Iowa 60.
 - water relations, effect of Bordeaux and oil sprays, Ohio 61.
 - winter hardiness test by artificial refrigeration, 212; Minn. 211.
 - woody, *see* Woody.
- Plasmodiophora*—
- brassicae*, *see* Cabbage clubroot.
 - solani*, description, 816.
 - vascularum*, life history, 534.
- Plasmolysis and—
- permeability to water, course, 187.
 - swelling in plant cells, 187.
- Plastein, nature, 484.

- Plathypena scabra*, *see* Clover worm, green.
- Platygaster hiemalis*, notes, 693.
- Ptenodorus meliloti*, notes, 535.
- Plesiocoris rugicollis*, notes, 73.
- Pleuropneumonia—
 - bovine, control by culture vaccines, 108.
 - in cattle, 421.
 - notes, Kans. 265.
 - virus, growth and metabolism, 108.
- Pleximeter, new, 711.
- Plodia interpunctella*, *see* Indian-meal moth.
- Plodia*, study of genus, 390.
- Plowing accessories, Ind. 116.
- Plum—
 - aphid, mealy, sprays for, Calif. 71.
 - black knot, control, 537.
 - curculio—
 - activity, relation to temperature, 384.
 - bionomics and control, Del. 71.
 - in apples, relation to temperature, 245.
 - notes, Mass. 686.
 - disease, new, 228.
 - diseases, control, 537.
 - hybrids, self and cross sterility in, 804.
 - pollen, viability and germination, 804.
 - trees, winter injury, 537.
- Plums—
 - breeding, Iowa 48.
 - Burbank, self sterility in, 804.
 - commercially canned, effect on reaction of urine, Wis. 890.
 - hybrid, pollen germination, 804.
 - landscape and windbreak tests, Fla. 209.
 - named seedlings, description, 799.
 - pollen development, 799.
 - pollination, Calif. 47; W.Va. 212.
 - varieties, blooming time, Ind. 48.
 - variety tests, Fla. 209; Ga.Coastal Plain 48.
- Plutella maculipennis*, *see* Diamond-back moth.
- Pneumonia—*see also* Pleuropneumonia.
 - contagious equine, blood pressure in, 580.
 - resistance, relation to vitamin A in liver, 900.
 - virus in animals, similarity to influenza and bronchopneumonia in man, 424.
- Pnyxia scabiei* in Ohio, 558; Ohio 693.
- Poison, acquired specific, supersensitivity, inheritance, 349.
- Poison baits for wireworms, field experiments, 84.
- Poison ivy, control by kainite, N.H. 353, 651.
- Poisonous plants, *see* Livestock poisoning, Plants, poisonous, and specific plants.
- Pollen—
 - abortion in species hybrids, 30.
 - tube growth in diploid and polyploid fruits, 799.

Pollination—*see also specific plants.*

by bees, device as aid to, 799.

studies, survey, 212.

Polyarthrititis infection in sheep, Calif. 104.

Polychrosis viteana, *see* Grape berry moth.

Polycythemia, cobalt, in rats, 754.

Polydactylism, dominance in man, 508.

Polydactyly in guinea pigs, inheritance, 32.

Polystictus versicolor growth, effect of temperature, 680.

Pomegranates, vitamin C in, 310.

Ponies, inheritance of piebald patterns and wall eyes in, 640.

Pontia rapae, *see* Cabbage worm, imported.

Pop corn—

breeding, Kans. 200.

variety tests, Kans. 200.

Popillia japonica, *see* Japanese beetle.

Poplar—

tulip, seedling growth, effect of varying amounts of nitrogen, 808.

yellow, characteristics, growth, and management, U.S.D.A. 808.

yellow, nectar secretion, 87.

Population—

centers of State and number of farms under health inspection, Ohio 127.

movement, back-to-the-land, urban and rural interest in, Mo. 601.

occupational and residential mobility in the Cotswolds, 444.

trends in Michigan, Mich. 744.

trends in New York State, N.Y.Cornell 140.

trends in United States, treatise, 458.

Pork—

cuts, proportion, differences between barrows and gilts, 406.

firmness, effect of rations, Nebr. 562.

production, *see* Pigs.

quality on soybean rations, 405.

vitamin B in, effect of cooking and canning, 468.

Porthetria dispar, *see* Gipsy moth.

Potash—

effect on citrus rots, 676.

effect on composition and weight of cottonseed, Miss. 514.

effect on composition and yield of citrus trees, Fla. 209.

effect on starch in potatoes, 647.

fertilizers in form of muscovite, Wis. 776.

Potassium—

absorption by wheat, effect of pH, 363.

assimilation by barley plants, 186.

cyanide experiments with rabbits, 421.

cyanide poisoning in sheep, effect of sulfur, 110, 421.

hexafluoroaluminate for Mexican bean beetle control, 84.

in corn tissues, form, Ohio 38.

iodide feeding, effect on iodine in blood and thyroids of sheep, 105.

movement in soil, 184.

Potassium—Continued.

nitrate, effect on healthy and leaf roll

Green Mountain potatoes, N.H. 670.

requirements of crops, test for, 780.

selective absorption by plants, 188.

status of soils and fruit plants in case of potassium deficiency, 799.

Potato—

aphid, transmission of cucumber mosaic by, 671.

aphid, vector of bean mosaic virus, 387.

aphids in Wales, 238.

beetle, Colorado, notes, Idaho 824.

blight, late, control, 65.

blight, late, spraying and dusting for, Me. 372.

blight, late, yield losses from, Me. 373.

blight, relation to time of planting and to weather, 533.

blight resistant variety, Me. 373.

calico, notes, Calif. 60.

canker, biology, 533.

canker, control, 224.

diseases—

seed and soil-borne, control, Iowa 60.

studies, 526; Fla. 221.

virus, control, N.Y.Cornell 61.

virus, notes, Calif. 60; Idaho 810.

virus, relation to insects, Me. 385.

virus, review of literature, 816.

virus, transmission experiments, 816.

Epilachna beetle in Mysore, 395.

flea beetle—

control, Conn.State 231; Colo. 835.

on tobacco, Conn.State 550.

western, studies, Wash. 549.

Fusarium wilt, relation to soil, Nebr. 526.

hopperburn, notes, N.Mex. 232.

hybrids, blight immune, N.Y.Cornell 61.

industry in Maine, 445.

insects, survey, Iowa 72.

leaf disease, monograph, 816.

leaf roll, notes, N.H. 373.

leafhopper, control, 384; Fla. 232.

leafhopper, notes, Fla. 231; Ind. 71.

leaves, growth in greenhouse and field, 342.

mosaic, notes, Me. 372; N.H. 373.

pink rot, notes, 817.

psyllid, feeding habits, 828.

psyllid yellows, notes, N.Mex. 232.

psyllid yellows, symptoms, 224.

Rhizoctonia infection, depth of planting experiments for, 817.

rotation, fertilized, N.H. 353.

scab, control, N.Y.Cornell 61.

scab gnat in Ohio, 558; Ohio 693.

scab, notes, Nebr. 526.

Synonym Committee, 1931-32 report, 201.

tuber defects, relation to millipedes and scab gnats, N.Y.Cornell 72.

Potato—Continued.

- tuber worm, control, cultural practices for, 78.
- tubers and seed pieces, rots of, Me. 372.
- tubers, dormancy, effect of sulfur compounds, 341.
- tubers, dormant, effect of chemical treatments, 507.
- Verticillium* wilt, notes, Wis. 810.
- wart disease, varieties immune from and susceptible to, 533.

Potatoes—

- accomplishments of station with, Alaska 36.
- adaptation of types to muck soil and new strains, N.Y.Cornell 38.
- blue discoloration, 65.
- breeding, Iowa 37; N.Y.Cornell 38.
- cooking quality, Me. 462.
- cost of production, Mich. 600.
- cost of production and labor returns N.Y.Cornell 127.
- culture and marketing, W.Va. 648.
- culture experiments, Fla. 199.
- Ga.Coastal Plain 37; Nebr. 512.
- culture, harvesting, and storage, Conn.Storrs 795.
- culture under irrigation, N.Mex. 282.
- dry-land production, Nebr. 790.
- effect of potash on starch in, 647.
- experiments at Sriniketan, 792.
- fertilizer elements, relative response to, 205.
- fertilizer experiments, Fla. 199; Ga.Coastal Plain 37; Me. 353; N.C. 205; Oreg. 354; U.S.D.A. 789; Wis. 791.
- fertilizer injury, symptoms, 647.
- fertilizer placement studies, Ohio 38.
- Florida, grading, packing, and stowing, Fla. 50.
- Green Mountain, effect of potassium nitrate, N.H. 670.
- growth inhibition by volatile substance from apples, Kans. 189.
- irrigation, Idaho 871.
- Jersey Redskin, characteristics, Tenn. 647.
- Lord Derby Gold Medal, tests, 201.
- market conditions in Chicago and other consuming centers, Wis. 881.
- marketing, N.Y.Cornell 127.
- marketing in Scotland, 610.
- mutations in, 28.
- on Long Island, insects affecting, N.Y.Cornell 72.
- outlook, Okla. 288.
- paper mulch test, Fla. 199.
- pitting, relation to wireworms, N.Y. Cornell 72.
- respiratory rate and sugar in, 506.
- root-stem transition region, vascular anatomy, 504.
- rotation experiments, U.S.D.A. 789.
- seed, blight, prevention in, 224.

Potatoes—Continued.

- seed, Indiana-grown v. imported, Ind. 37.
 - seed source tests, Ga.Coastal Plain 37; R.I. 200.
 - seed, studies, Nebr. 512.
 - seed, treatment, Me. 373.
 - spacing, spraying, and overhead irrigation tests, Ohio 38.
 - spraying and dusting experiments, Mich. 648.
 - spraying and dusting, factors affecting efficiency, N.Y.Cornell 61.
 - spraying experiments on muck lands, N.Y.Cornell 72.
 - spraying with Bordeaux mixture, Conn. State 221; Ohio 61.
 - storage studies, N.Y.Cornell 360.
 - tests of combinations of contact insecticides and fungicides, 817.
 - varieties, disease resistance, Mass. 663.
 - varieties, irrigation and spraying tests, N.Mex. 200.
 - varieties, time of digging, Alaska 36.
 - variety tests, Alaska 36; Kans. 200; Oreg. 354; U.S.D.A. 789.
 - vitamins C and G in, Idaho 898.
 - vitamins in, effect of cooking, canning, and storage, 617.
 - Warba, characteristics, 795.
 - Warba, notes, 622.
 - Wisconsin, marketing, Wis. 881.
- Potentiometer—
- electron tube, for determination of redox potentials, 327.
 - simple, inexpensive electron tube for, 327.
- Poultry—see also Chicks, Ducks, Fowls, Hens, etc.
- arsenic poisoning in, 436.
 - autopsies, Ind. 104.
 - batteries for, Ohio 570.
 - breeding, 411; Kans. 195; Mass. 641.
 - breeding and feeding, N.Mex. 249.
 - brooder, home-made brick, N.C. 442.
 - brooders, electric and coal, comparison, Idaho 839.
 - brooders, ventilation, Calif. 116.
 - business, wholesale, in San Francisco, 457.
 - calcium-phosphorus ratio in rations, effect, 570.
 - Congress, World's, 160.
 - culling, 569.
 - disease due to hemolytic streptococcus, 114.
 - disease elimination law, Mass. 709.
 - disease, new, 280.
 - diseases—see also specific diseases.
 - character and extent, 278.
 - in Rhode Island, R.I. 278.
 - notes, 593; Iowa 104; Kans. 265.
 - virus, 711.
 - effect of inbreeding, linebreeding, outbreeding, and crossbreeding, Iowa 89.

Poultry—Continued.

- electric water heaters for, Ind. 125.
- equipment, types, Mich. 125.
- feeding, comparative nutritive value of certain grains, Kans. 249.
- feeding, efficiency of proteins in, Nebr. 562.
- feeding experiments, Ariz. 701; Wis. 839.
- flock management, Kans. 249.
- flocks, Ohio Record of Performance, production, 847.
- grazing crops for, N.C. 94.
- heat production under housing conditions, 442.
- house roofs, Calif. 116.
- houses, artificial lighting, 125.
- houses, temperature and humidity in, Ind. 116.
- houses, ventilation, N.Y.Cornell 116.
- housing, 599; Ind. 89.
- inbreeding and intercrossing in, 641.
- industry, application of ultraviolet radiation in, 256.
- industry, distribution in State, Kans. 288.
- industry of Union of South Africa, 450.
- industry, resistant to depression, U.S. D.A. 697.
- inheritance of egg quality and feather characters, Calif. 88.
- laying flock records, analysis, Mich. 158.
- mass treatment for *Ascaridia lineata*, 593.
- molting and housing experiments, Ariz. 702.
- products, marketing, teaching in evening agricultural schools, 141.
- raising experiments, experimental errors in, 410.
- ration, cooking, effect on vitamins, Wis. 839.
- rations, effect of red light on anti-rachitic substances, Me. 410.
- rations, value of grit in, Calif. 88.
- resistance to nematodes, effect of diet, 593.
- resistance to parasitism, factors affecting, Kans. 266.
- slipped tendons, inheritance, Kans. 249.
- source of calcium for, Idaho 839.
- toxicity and palatability of *Crotalaria* seed, Fla. 248.
- ultraviolet ray treatment, 287.
- vermifuges, studies, 720.

Poults—

- effect of feeding vitamin A deficient rations, Kans. 249.
- vitamin A requirements, Kans. 249.

Power—

- agricultural use near Bologna, 727.
- and machinery in agriculture, U.S.D.A. 727.

Praepharnus, new genus, description, 387.

Precipitation, *see* Rainfall.

Precipitin tests in zoology and medicine, factors affecting, 422.

Pregnancy—

- cells in hypophyses, 512.
- cells in pituitary, relation to reproductive cycle, 642.
- delayed, in mice, 642.
- mineral metabolism in, 755.
- test in animals, 352.

Prestone, freezing and flow points for, 122.

Price fixing in New Zealand, 298.

Price level, raising, provisions for, Okla. 737.

Prices—

- and gold, N.Y.Cornell 127.
- farmers' response to, bibliography, U.S.D.A. 739.
- studies, 737.
- wholesale, 1720-1932, N.Y.Cornell 296.

Prionoxyastus robiniae, *see* Carpenter worm.

Prionus californicus, notes, N.Mex. 232.

Production in United States, physical volume, N.Y.Cornell 295.

Prolan and hypophyseal preparations, increased gonadotropic effects, 511.

Proline and hydroxyproline, indispensability in nutrition, 144.

Promecotheca cumingii, fungus disease of, 832.

Prooestrous bleeding in dog, homology, 352.

Prophanurus alecto, notes, U.S.D.A. 692.

Propylene dichloride—

- as fumigating material, 73.
- mixture for fumigation against European corn borer, 832.

Prostate glands of rats as indicators of testicular hormone, 512.

Protein—

- concentrates, evaluation, Ind. 89.
- consumption and requirement of children, Ohio 616.
- intake and vitamin G, 472.
- intake of well-nourished adolescent girls, 893.
- rations for poultry, 569.
- requirements of chicks from battery brooders, N.H. 569.

Proteins—

- alcohol-soluble, from milk products, 418.
- biological values, 406, 895.
- in rations of hens, effect on egg production and hatchability, 96.
- role in etiology of kidney disease, 152.
- solutions, transference and conductivity studies, 483.
- source in hens' diet, effect on embryonic mortality, 703.
- source of oxidative energy for muscular exercise, 464.
- structure and hydration, 315.
- sulfur in, 483.
- vegetable, studies, 144.

Protocalliphora avium—

- notes, 382.
- parasite of, 398.

Protoplasmic organization, methods of study, papers on, 188.

Protozoa—

- intestinal, of man, relation to animal pests, 266.
- of rumen of Chinese cattle and sheep, 275.

Prune—

- diamond canker, Calif. 60.
- die-back, notes, Calif. 60.
- trees, effects of starvation on distribution of mineral nutrients, 658.
- trees, movement of mineral plant foods in, Calif. 47.
- worm, control, Idaho 824.
- worm, notes, Idaho 824.

Prunes—

- dried, effect of ingestion, Wis. 890.
- French, seasonal absorption of nutrient salts, 55.
- maturity and storage, Idaho 214.
- quality, effect of irrigation, 659.

Pruning—*see also specific crops.*
studies, N.Y.Cornell 53.

Prunus species crosses, fruit and leaf characters in, 785.

Pseudocneorrhinus setosus, notes, Conn. State 546.

Pseudococcus—

- brevipes*, *see* Mealybug, pineapple.
- citri*, *see* Mealybug, citrus.
- maritimus*, *see* Mealybug, grape.

Pseudomonas—

- oryzae*, notes, 225.
- radicicola*, *see* Nodule bacteria.
- rhizogenes*, notes, 811.
- sesami*, *Bacterium sesami* and *B. sesamicola*, comparative studies, 67.
- utiformica* n.sp. on pears, N.Y.Cornell 61.

Pseudorabies—*see also* Aujeszky's disease.
and mad itch, identity of viruses causing, 266.

Pseudosynonymcha japonica, biology, 560.

Pseudotuberculosis of sheep, 110.

Psila nigricornis as chrysanthemum pest, 558.

Psila rosae, *see* Carrot rust fly.

Psittacidae diseases liable to be confused with psittacosis, 271.

Psorophora columbiae, studies, 82.

Psyllia mali, *see* Apple sucker.

Psyllids, South African, new species, 686.

Pteroncus ribesii, *see* Currant worm, imported.

Ptinus tectus, biology, 233.

Ptinus tectus, notes, 685.

Puccinia graminis, origin of physiologic forms, 63.

Pucciniastrum americanum on raspberries, N.Y.Cornell 61.

Puerto Rico Insular Station, report, 909.

Puerto Rico Station, report, 158.

Pullets—*see also* Fowls and Poultry.

- body weight and age at sexual maturity, relation, 846.
- cost of production, Mich. 97.

Pullets—Continued.

- effect of cod-liver oil, Ky. 704.
- from hen v. pullet eggs, Ohio 90.
- labor income and costs, Del. 126.
- laying, effect of management during growth, Ohio 90.
- mortality in, correcting, Calif. 88.
- protein requirements, Ind. 89.
- rations for, Del. 89.
- vitamin A requirements, Tex. 95.

Pullorum disease—

- and intestinal parasites in poultry, Idaho 865.
- control, incubator hygiene in, Ill. 115.
- diagnosis, 280.
- diagnosis, stained-antigen, whole-blood agglutination test for, 114.
- epizootological behavior, Nebr. 578.
- eradication, N.H. 420.
- hereditary resistance to, 862.
- in poultry, Ind. 104.
- incubator-disseminated, suppression and control, 435.
- relation to hemorrhagic septicemia, 578.
- studies, Calif. 104; Mass. 709; Wis. 865.
- value of agglutination test, 114.

Pulses—

- germinated, vitamin C in, 310.
- Indian, studies, 191, 192, 795.

Pumpkins, canning quality, Ind. 48.

Purdue University, notes, 159.

Purines determination, iodometric method, 174.

Purple scale—

- control, lime-sulfur for, Fla. 231.
- notes, Tex. 384.

Pyrausta nubilalis, *see* Corn borer, European.

Pyrethrum—

- dust, tests, Mass. 687.
- extracts, petroleum distillates as bases for, 551.
- fields of Dalmatia, account, 683.
- insecticidal value, N.J. 383.
- kerosene extracts, insecticidal efficiency, 824.
- powder for control of lice and sheep ticks in winter, Mich. 581.
- powders, extractive efficiency of kerosene on, 74.
- studies, 235.
- tests, V.I. 520.
- undiluted paraffin extract, field spraying of coffee trees with, 551.

Pyroligneous acid as soil disinfectant, Mass. 663.

Pyronine, effect on agglutinin titer in abortion infected cows, 108.

Pyruvic acid and vitamin B₁ deficiency, 902.

Pythium—

- artotrogus*, notes, 531.
- butleri* on beans in shipment, 813.
- growth curves, 187.

Quackgrass, control, Oreg. 354.

Quail—

- Bacterium tularense* from, 271.
- bobwhite, disease affecting, 864.
- bobwhite, in Ohio, abundance and conservation, 381.
- bobwhite, in Ohio, helminths and coccidia from, 268.
- bobwhite, wintering in Wisconsin, 682.
- toxicity and palatability of *Crotalaria* seed, Fla. 248.
- winter, study, 824.

Quartz, crushing and fine grinding, 323.

Rabbits—

- Angora, treatise, 572.
- blood group inheritance in, 195.
- blood groups in, 510.
- body color and eye color, genetic relation, 509.
- breed variability in, 787.
- composition of carcasses, 572.
- effect of alcohol on germ cells, N.Y. Cornell 35.
- furless, 641.
- glutathione concentration and hereditary body size, 787.
- immature, effect of phyone injections, 643.
- lilac, rexing, 509.
- size inheritance, relation to sulfhydryl concentration, 509.
- snowshoe, in western Canada, abundance, relation to helminth parasitism, 382.
- treatise, 847.

Rabies—

- experimental, of rabbits, 579.
- in Union of South Africa, 420.

Radiant energy, physiological effects, 897.

Radiation, *see* Solar radiation.

Radio—

- Research Board of Australia, report, 495.
- waves, effect on insect pests, 685.
- waves, effect on internal temperatures of insects, 230.

Ragi—

- genetic studies, 784.
- inheritance of characters in, 29.

Ragweed, control, U.S.D.A. 651.

Ragwort, poisonous to cattle in Victoria, 581.

Rainfall—

- desert, 14.
- of Malta and long-period forecasting, 178.

Raininess charts of United States, U.S.D.A. 332.

Raisins, production, 883.

Rams—

- foul sheath infection, Idaho 865.
- of different breeds for producing market lambs, value, Calif. 88.

Rancidity, chemical study, Minn. 167.

Range—

- caterpillar in New Mexico, natural control, 830.

Range—Continued.

caterpillar, New Mexico, parasite of, equipment and methods of rearing, 836.

conditions in Wood Buffalo Park of Canada, 681.

grasses, *see* Grasses.

land in public land State, factors affecting use, U.S.D.A. 601.

plants, poisonous, *see* Plants, poisonous, Livestock poisoning, and *specific plants*.

plants, tests, N.Mex. 200.

Raphanus—

and *Brassica* hybrids, sexual incompatibility, 508.

growth curves, 187.

Raspberries—

black, hybridization, Iowa 48.

changes after picking, 748.

culture and disease control, N.Y.State 369.

fertilizer requirements, Ohio 49.

growing in West Virginia, W.Va. 215.

mites affecting, control, 247.

Naples black, description, N.Y.State 367.

Potomac, description, U.S.D.A. 56.

pruning, 215.

variety tests, Mass. 652.

Raspberry—

beetle, control, 695.

diseases, control in Quebec, 378.

leaf rust, N.Y.Cornell 61.

orange rust, notes, N.J. 373.

seedlings, new varieties, 212.

virus disease, control, Ohio 61.

Rat-bite fever spirochete, drug refractoriness, 421.

Rations, nutritive value, net energy as measure, 405.

Rats—*see also* Rodents.

cytogenetic studies, 194.

in Canton, China, animal parasites of, 544.

International Conference and Colonial Congress on, 229.

longevity and optimum growth, compatibility, 752.

notes, Kans. 232.

toxic baits for, tests, Mass. 682.

Rayon, regenerated cellulose and cellulose acetate, quantitative estimation, 476.

Real estate—*see also* Farm real estate.

problems of Minnesota department of rural credits, 443.

Recreational uses of land in Massachusetts, Mass. 291.

Red mite control, 73.

Red scale—

California, effect of hydrocyanic acid gas, 388.

California, notes, Tex. 384.

California, variation in population density in hilly lemon grove, 829.

control, progress in, 690.

Red scale—Continued.

- insecticides for control, Calif. 71.
- on citrus, laurel-sumac as source of infestation, 77.

Red spider—

- development, effect of temperature, Mass. 686.
- notes, Tex. 384.

Red squill, canned, as rat bait, Mass. 682.

Redpepper, vitamin A in, 617.

Redwater, *see* Piroplasmosis, bovine.

Redwood regions, logging methods, Calif. 59.

Reed canary grass—

- breeding, Idaho 788; Iowa 37.
- characteristics, Idaho 795.
- culture experiments, Idaho 788; Iowa 37.
- on peat soil, Wis. 791.

Refrigeration—

- artificial, for studying winter hardiness, 212; Minn. 211.
- in rural homes, methods, R.I. 317.
- mechanical, for dairy farms, Ind. 125.

Refrigerators—

- current consumption, Ind. 156.
- use and care, 621.

Rehmiellopsis bohémica, notes, 679.

Resins, synthetic, 324.

Respiration—

- and oxygen concentration, 187.
- in barley leaves and catalase activity, 26.
- in cranberry plants, 343.
- in plants, oxybiotic and anoxybiotic, 187.
- vesicular, genesis, 580.

Reticulitermes hesperus, association with fungi, 553.*Rhabdopyris zeae*, notes, 396.*Rhabditis*—

- lamdbiensis* as carrier of disease in mushroom beds, 375.
- spp., notes, 228.

Rhagoletis—

- cingulata*, *see* Cherry fruit flies.
- pomonella*, *see* Apple maggot.
- spp., habits, 833.
- suavis*, life history notes, 395.

Rhizobium—

- physiological characteristics, Iowa 16.
- spp., production of gum by, Iowa 505.
- trifolii*, abnormal types, characteristics, Wis. 791.

Rhizoctonia—

- bataticola*, notes, 373.
- on potatoes, depth of planting experiments for, 817.
- root rot on peas, Ariz. 65.
- solani*, efficiency of fungicides for control, Kans. 222.
- solani* on beans in shipment, 813.
- solani*, sclerotia of various sizes, toxicity of fungicides to, 670.
- spp., notes, 526.
- spp. on potatoes, control, Me. 373.
- violacea*, notes, U.S.D.A. and Tex. 528.

Rhizopertha dominica—

- as library pest, 73.
- life history, 835.

Rhizopus—

- betavora* as potential agent of root rot, 672.
- spp. on beans in shipment, 813.
- tritici*, relation to thermogenesis in stored hay, Iowa 27.

Rhode Island College, notes, 912.

Rhode Island Station, notes, 912.

Rhode Island Station, report, 318.

Rhodesia, Southern, helminthological survey, 544.

Rhododendron, insects and diseases, 687.

Rhododendron ponticum, growth in sand cultures, 524.*Rhodotypos kerrioides* seeds, after-ripening, 188.

Rhubarb, composition at different stages of maturity, 366.

Rhyacionia—

- buoliana*, *see* Pine shoot moth, European.

frustrana in Canada, 547.*Rhynchosporium secalis*, method of spore formation, 63.

Rice—

- blast disease in Bulgaria, 534.
- borer, Asiatic, in China, 234.
- borer, effect of low temperatures, 391.
- borers, revision and distribution, 692.
- bran bread, vitamin B in, Hawaii 747.
- bran, wheat germ, and dried yeast, comparison for vitamin B in, Hawaii 747.
- breakage in milling, tests, machines for, 286.
- breeding, Calif. 37.
- breeding experiments in India, 792.
- disease in Arkansas, cause, 671.
- diseases in Japan, 225.
- experiments in Sriniketan, 792.
- farms, organization and operation, La. 128.
- fertilizer experiments, Calif. 37.
- flour for cakes and muffins, 892.
- flowering, pollination, and natural crossing, 44.
- foot rot, control, 818.
- germination, effect of reduced oxygen pressure, 44.
- growth in heavy black soils of Central Provinces, 795.
- in Surma Valley, classification, 795.
- Indian, vitamin B in, 761.
- leaf beetle, morphology and ecology. 560.
- mentek disease, 225.
- plant, nitrogen intake, 796.
- polish, feeding value, 406.
- polish, oryzanin isolation from, 6.
- seeds, internal infection by fungi, 66.
- soils, nitrogen fixing micro-organisms, 502.
- stem rot, control by burning stubble, 818.

- Rice—Continued.
 vitamin B (B_1) and phosphorus in,
 effect of parboiling and milling, 469.
 wild, hybrids, characters, 30.
- Rickets—
 comparative value of several light
 sources for, 313.
 experimental, as phosphorus-deficiency
 disease, 473.
 experimental, changes in phosphoric
 esters of red blood cells and liver,
 473.
 experimental, in rats, 578.
 in chicks, control, Iowa 89.
 in chicks, factors affecting, Iowa 104.
 in rats, calcium and phosphorus con-
 tent of brain in, 155.
 magnesium, studies, 155.
 prevention and cure, 474.
 prevention, effect of New Orleans sun-
 shine, 313.
 producing diets which promote satis-
 factory growth, 474.
 ultraviolet irradiation, amount rela-
 tion to area of skin exposed, 314.
 ultraviolet treatment, effect on intes-
 tinal flora, 473.
- Rinderpest—
 chronic, unusual case, 583.
 clinical syndrome in goats in India,
 868.
 studies, 424.
 transmission by contact, 583.
 variations of serum proteins during,
 868.
 virus, duration in immunized cattle,
 105.
- River stages, daily, at gage stations,
 U.S.D.A. 282.
- Roach, oriental, effect of dusts, 826.
- Road finance, rural Ohio's contribution,
 Ohio 128.
- Roads, low cost, tar surface treatment,
 U.S.D.A. 284.
- Rock gardens—
 construction and planting, Mich. 216.
 plants for, Mich. 217.
 treatise, 524.
- Rock phosphate, *see* Phosphate.
- Rocky Mountain spotted fever—
 and boutonneuse fever, immunological
 relation, 583.
 and exanthematic typhus of Sao Paulo,
 relation, 400.
 tick, studies, Mont. 247.
 tick, transmission of anaplasmosis by,
 269.
 virus, convalescent sera of Sao Paulo
 exanthematic typhus against, 869.
 virus, sexual transmission in the wood
 tick, 400.
- Rocky Mountain wood tick, *Bacterium tu-
 larensis* of low virulence isolated from,
 712.
- Rodenticides, composition, Conn.State 234.
- Rodents—*see also* Mice and Rats.
 of France, classification and control,
 381.
 prevalence and control, Fla. 232.
- Roentgen rays, *see* X-rays.
- Root—
 crops, diseases, 526.
 crops for livestock, culture and har-
 vesting, U.S.D.A. 354.
 knot nematode—
 control with carbon disulfide emul-
 sion, Mass. 220.
 development, relation to tempera-
 ture, Calif. 542.
 plants attacked by, list, U.S.D.A.
 681.
 reproduction without males, Calif.
 542.
 knot, notes, Fla. 231.
 nodules, *see* Nodule bacteria.
 rot, fungi accompanying rotting as po-
 tential agents, 672.
 rot, notes, N.Mex. 222.
 rot, resistance of plants to, 528.
 studies, 654.
- Roots—
 feeding value, 257.
 feeding value for dairy cows, W.Va.
 848.
 regenerative organ formation in, 341.
- Rose—
 chafers, notes, Fla. 231.
 diseases and insects, control, Va.Truck
 678.
 diseases, control, N.Y.Cornell 61.
 leafhopper, control, 384.
- Roses—
 annual treatise, 369.
 chromosomes, multiple pairing, hybrid-
 ity, and fragments in, 347.
 effect of plant nutrients, Mass. 652.
- Rotation of crops, Idaho 789; Ind. 37;
 Kans. 200; Nebr. 512; Oreg. 354.
 effect on anchorage of corn plants, Va.
 41.
 value in Coastal Plain area, N.C. 128.
- Rotenone—
 deposits, loss in toxicity when exposed
 to light, 234.
 in derris root and other plant ma-
 terials, 234.
 in Malayan tuba root, 75.
 in species of Fabaceae, chemical rela-
 tionship, 683.
 insecticidal value, N.J. 383.
 new parasiticide, 423.
- Roughage—
 production, N.H. 445.
 single and mixed, comparison, 699.
- Rous' sarcoma in fowls, pH of blood, 115.
- Rubber—
 cortex, formation of internal fissures
 in, 189.
Oidium leaf disease, 379.
- Runoff, divisor for taking aliquots of, 721.

Rural—

changes, effect on younger generation, 737.

China and rural America, contrast in social pattern, 302.

church, sociological analysis, 301.

community, sociological study, treatise, 300.

credit, *see* Agricultural credit.

home makers, paid work done by, R.I. 317.

life of Japan, effect of cultural patterns, 302.

organization, research in, 299.

population—

and urban population, reclassification, 141.

in Ohio, movement, Ohio 139.

migration in Santuc Township, S.C. 140.

of four townships, social activities of families, Pa. 614.

schools, *see* Schools, rural.

social trends, treatise, 299.

standards of living, *see* Standard.

Rust—*see also specific hosts.*

collections from northwestern States, 811.

fungi, heterothallism and hybridism in, 372.

mite, notes, Tex. 384.

Rutabagas, *see* Swedes.

Rutgers University, notes, 911.

Rye—

acre values, Minn. 201.

and wheat hybrids, studies, Ga. 199.

antirachitic properties, 755.

as green manure, Ohio 17.

autogamous Turkistan, characteristics, 44.

diseases, control methods, 222.

dry-land production, Nebr. 789.

feeding value compared with other grains, 840.

feeding value for pigs, Nebr. 562.

flour for cakes and muffins, 892.

for fattening calves, Nebr. 562.

hybrids, pollen abortion in, 30.

jointworm, distribution and damage, Utah 837.

leaf blotch near Cambridge, England, 63.

production in Germany, effect of climate, 178.

straw, effect on vegetables, 183.

straw worm, distribution and damage, Utah 837.

use of effused nitrogen compounds from legumes, 782.

varieties on peat and sandy lands, Minn. 201.

variety tests, Ga.Coastal Plain 37; Ind. 789; Me. 353; Oreg. 354.

yields, Ind. 789.

Ryegrass—

Italian, effect on barley, 644.

Italian, yield and composition for bottom land, 354.

perennial, glyceride fatty acids from, 487.

ultraviolet light fluorescence reaction in, 345.

Sachs, Julius, founder of new plant physiology, 1832-1897, treatise, 341.

Sago pith meal, feeding value for pigs, 566.

Sainfoin seed, effect of milling, 644.

St. Johnswort, studies, Calif. 37.

Salamanders, effect on rural water supplies, 117.

Saliva, bovine, chemical composition, 421.

Salmon oil as source of vitamin D, Ohio 90.

Salmonella—

aertrycke in chicks, 596.

Dublin type, in calves, 105.

enteritidis, epidemic infection of guinea pigs with, 869.

enteritidis, resistance or susceptibility in mice, 511.

food poisoning, problems, 897.

infections, sporadic, in Aberdeen, 583.

organism, Breslau or Aertryck type, immunization, 582.

pullorum, *see* Pullorum disease.

suipestifer—

bacteriophage lysates, antigenic properties, 869.

in pigs, Ind. 104.

infection in children, 582.

Salt-copper-iron mixture for cattle and swine, Fla. 248.

Salt—

requirements of chicks, Wis. 839.

solutions and sea water, corrosion of metals in, 724.

solutions, evaporation from, 722.

Salvarsan, injuries resulting from intravenous administrations, 710.

San Jose scale—

control, 232.

control, efficiency of tar distillate sprays, 239.

control in Northwest, 545.

in Georgia, effect of low temperature, 685.

in Union of South Africa, 556.

notes, 547; Idaho 824; N.Mex. 232.

Sand—

and calcium bentonite mixture as growth medium in pot culture, 782.

flies, salt marsh, studies, 243.

flies, studies, new method in, 243.

fly larvae in salt marshes, seasonal incidence and concentrations, 267.

organic impurities in, measurement, 327.

Sandal spike disease, 380.

Sandy lands, crop experiments on, Minn. 201.

Sanninoidea exitiosa, *see* Peach borer.

- Sarcosporidia of bovines in Switzerland. 715.
- Sardine oil, antirachitic value for chicks, 845.
- Sardines, dried, vitamin D and proteins in, effect of methods of drying, Me. 410.
- Satin moth spread, Conn.State 546.
- Sawflies, new, in forests of Canada, 561.
- Sawfly—
affecting pines in Mexico, 561.
birch leaf-mining, life history and morphology, Conn.State 399.
- Scab control, new and old materials for, comparison, Mich. 68.
- Scale—
insect honeydew from incense cedar, 555.
insects and *Septobasidium*, biological relation, 372.
menace to Virginia orchards, 386.
soft brown, notes, Tex. 384.
- Sceliphron caementarium*, metamorphosis, pH changes of body fluids during, 696.
- Schistocerca gregaria* in Egypt, 688.
- Schistosoma*—
indicum in equines in India, 860.
nasalis n.sp., notes, 858.
spindalis, notes, 587.
- Schistosomes in bovine nasal granuloma tissue, 588.
- Schoenobius*—
bipunctifer in China, 234.
incertellus, effect of low temperatures, 391.
- Schools—
agricultural, *see* Agricultural schools.
preparatory, physical unfitness in, 306.
public, home economics in, statistical survey, 459.
rural, organization in Michigan, Mich. 302.
- Sciara pullula* larvae, nematode parasite, 838.
- Science related to home, teaching, 142.
- Sclerospora macrospora*, notes, 534.
- Sclerotinia*—
americana, notes, 537.
fructigena, cause of apple canker, 376.
gladioli, sexual function of microconidia in, N.Y.Cornell 61.
sclerotiorum, notes, N.Y.Cornell 61; Tex. 541.
sclerotiorum on beans in shipment, 813.
- Sclerotium*—
fumigatum, morphology and cultural characters, 664.
oryzae, notes, 225, 534.
rolfsii on beans in shipment, 813.
rolfsii on strawberry roots, Fla. 221.
- Scolytus*—
destructor, notes, 560.
scolytus, relation to Dutch elm disease, 70, 245.
- Screw threads, friction, 120.
- Scrip and barter in United States, bibliography, U.S.D.A. 139.
- Scurfy scale, oil emulsions for, 824.
- Scurvy—
development, relation to adrenal cortex, 475.
effect on adrenals, 619, 620.
experimental, production, 105.
glucuronic acid in, 762.
- Scutigera immaculata*, *see* Centipede, garden.
- Sedge, native, analyses, Alaska 36.
- Seed—
laws and regulations of Maryland, Md. 520.
testing station for England and Wales, report, 208.
- Seed-corn maggot—
studies, 694.
unreported habit, 824.
- Seedlings, mutilated, regeneration in, 782.
- Seeds—
analyses, 208.
exposure to high-voltage X-rays, effects, 638.
germination and growth of seedlings, effect of ultraviolet radiation, 506.
germination after years of storage, 363.
germination, new method, 188.
inspection, Mass. 363; N.J. 363.
testing and inspection, Mont. 46.
tests, Iowa 38; Me. 519.
vegetable, germination, effect of fertilizers, Ga. 209.
vegetable, on sale in New York, quality, N.Y.State 210.
weed, *see* Weed seeds.
- Seiurus pomi*, notes, Wash. 562.
- Seiurus* sp., notes, U.S.D.A. 691.
- Sematuridae of South Africa, 557.
- Seminal vesicles of rats as indicators of testicular hormone, 512.
- Senecio* species, poisonous to livestock, 272.
- Septic tanks—
and sanitary privies for France, 736.
studies, N.J. 287.
- Septicemia—
hemorrhagic, of reindeer, 710.
hemorrhagic, relation to pullorum disease, 578.
of pigs, 580.
- Septobasidium* and scale insects, biological relation, 372.
- Septoria*—
apii, notes, 532.
azaleae in Japan, 229.
callistephi on China aster, 229.
spp. in Japan, new or noteworthy, 229.
tritici, notes, 64.
- Serological-botanical studies, 343.
- Serum, *see* Blood.
- Sesia pictipes*, *see* Peach borer, lesser.
- Setaria labiata-papillosa* from udder of cow, 268.
- Seurocyrnea colini*, notes, 268.

Sewage—

- disposal systems for isolated residences, N.J. 287.
- disposal systems for use in France, 736.
- examination, standard methods, 330.

Sex—

- hormone influencing, 710.
- hormone of anterior pituitary, effect on normal and semicastrated rats, 350.
- in progeny of mammals, artificial control, 642.
- inheritance in horses, 640.
- organs, effect of long continued injections of acid extract of anterior pituitary, 350.
- ratio in mules, 348.
- relation to crossing over in fowls, 32.
- reversal, partial, in fowls, 511.

Sexual—

- cycles, mammalian, modification, 34.
- maturity, precocious, induction by cortico-adrenal extract, 197.

Sexuality, physical chemistry of, 349.

Shade trees—

- fertilizer and planting studies, N.Y. Cornell 57.
- nutrient needs, Ohio 49.

Sheep—see also Ewes and Lambs.

- and lamb situation, Okla. 288.
- artificial insemination, Russian methods, 642.
- autopsies, Ind. 104.
- blood of, biochemical studies, 105.
- botfly, control, 858.
- botfly, life cycle, 394.
- botfly, notes, Idaho 865.
- breeds for wool, comparison, Kans. 249.
- care, feeding, and management, Iowa 408.
- Chinese, protozoan fauna of rumen, 275.
- circling disease in New Zealand, 858.
- disease, new, on tick-infested farms of Scotland, 110.
- energy metabolism during lying and standing, Mo. 407.
- fat rump and tail, morphology, 349.
- feeding, N.J. 408.
- Hampshire-Rambouillet crossbreds, wool inheritance in, Wyo. 786.
- maintenance requirement, Wood and Capstick's method of calculating, 408.
- Merino, effect of sulfur and resistance to potassium cyanide poisoning, 110.
- Merino, normal temperature during January in the Karroo, 421.
- multinipple, results of crossing, N.H. 348.
- multiple births in, 348.
- on calcium deficient ration, effect of lime and cod-liver oil, 564.
- parasites affecting, V.I. 585.
- pasture tests, Nev. 93.
- poisoning, see Livestock poisoning, Plants, poisonous, and specific plants.

Sheep—Continued.

- raising in United States, change since pioneer period, U.S.D.A. 697.
- raising, success in, Ohio 880.
- Rambouillet, inbreeding and genetic history, 509.
- Rambouillet, move toward registry of merit for, 406.
- range, production in western Canada, 609.
- receipts at Oklahoma City markets, 1923-32, Okla. 288.
- stomach worm, effect of nutritional state, 320.
- studies, N.Y. Cornell 90.
- twinning, sex ratios, and variability in birth weight, 31.
- worms, size of eggs, 105.

Sherbets—

- and ices, effect of stabilizers on, Calif. 98.
- gelatin in, Kans. 257.
- viability of *Lactobacillus acidophilus* in, 265.

Shigella equirulis, notes, Ky. 111.

Shipping fever, see Pleuropneumonia.

Shortenings and keeping quality of crackers, Minn. 168.

Shrimps, body oils, vitamin A in, 150.

Shrubs—

- and trees for the garden, treatise, 525.
- mycorrhizas of, 637.
- ornamental, ammonium sulfate v. sodium nitrate for, R.I. 210.
- ornamental, tests, U.S.D.A. 807.

Silage—

- alfalfa-molasses, U.S.D.A. 848.
- combinations for, Oreg. 354.
- corn, feeding value, Wyo. 93.
- corn, v. mangels for milk production, W.Va. 848.
- cutter, modified, and hay fork for storing hay, comparative efficiencies, Iowa 98.
- cutters, tests, 879.
- feeding value for dairy cows, Conn. Storrs 572.
- from sliced potatoes and freshly cut hay, Alaska 88.
- grass, made in various ways, digestibility and feeding value, 250.
- green oats and corn, ensiled in trench silo without chopping, results, Ga. 248.
- harvester, notes, Ind. 116.
- loading, labor requirements, Mass. 737.
- lower cost, production, 405.
- making and construction of silos in Kenya, 840.
- manufacture and use, 840.
- pea vine v. corn, Wis. 848.
- production costs, factors affecting, Mass. 737.
- rationing to cows, 705.
- sorghum, as source of vitamin A for cows, Tex. 100.

- Silage—Continued.
 sorgo, effect of stage of maturity, Kans. 257.
 sorgo, varieties for milk production, Kans. 257.
 weight determinations, Kans. 257.
- Silica—
 gel, adsorption, theory and applications, 323.
 in tissue, micro gravimetric determination, 170.
- Silk—
 artificial, *see* rayon.
 fibroin, changes caused by tin weighting, 906.
 filaments, tensile properties, 315.
 natural, dispergation and aggregation in aqueous solutions of neutral salts, 324.
 of different origins, regain, 315.
 quantitative estimation, 476.
 swelling, 315.
- Silo walls, preservative treatments, 733, 734.
- Silos—
 ensilage, and silage in Kenya, 840.
 filling with field silage harvester, 440; Minn. 123.
- Silver mite on prunes, Idaho 824.
- Silver nitrate-potassium cyanide solution in vacuo for bulb sterilization, 823.
- Simaethis pariana*, *see* Apple and thorn skeletonizer.
- Simulium*—
 sp. attacking horses and cattle, 105.
venustum, transmission of *Leucocytozoon anatis* in ducks by, 281.
- Sinalbin as indicator, 489.
- Siphons, behavior, 874.
- Sires—*see also* Bulls.
 effect on butterfat production of daughters, Nebr. 572.
 evaluating by show ring winnings, 405.
 evaluation, progeny test, 573.
 proved, tests, U.S.D.A. 848.
 selection by progeny to maintain butterfat level, Mich. 101.
- Sttona* spp., biology, 233.
- Sitophilus granaria*, *see* Granary weevil.
- Sitotroga cerealella*, *see* Angoumois grain moth.
- Sitotroga* production, 232.
- Size inheritance—
 in rabbits, relation to sulfhydryl concentration, 509.
 studies, 193.
- Skim milk—
 acid coagulation, effect of pasteurization temperature, 261.
 condensed, use of dextrose in, 854.
 dried, vitamin B and G in, 418.
 dry, use in cottage cheese manufacture, Mo. 574.
 fat losses in, effect of agitation before separation, 851.
 powder v. blood flour for calves, Ohio 99.
- Skim milk—Continued.
 powdered, for dairy calves, Del. 98.
 use in hog ration, Wis. 839.
- Skins, *see* Hide.
- Slag, *see* Phosphatic slag.
- Slugs, notes, Calif. 71.
- Sminthurus viridis*, biological control, 552.
- Smoke and industrial fumes, damage to Imatra State Park trees, 638.
- Smut fungi, physiology and genetics, 372.
- Snails—
 injurious to vegetables in Japan, 682.
 notes, Calif. 71.
- Snapdragon—
 rust, breeding for resistance, Mass. 652.
 wilt of greenhouse plants, Tex. 541.
- Snapdragons, *Phytophthora* disease of, 823.
- Snout beetle, European, new to United States, 685.
- Snowberry—
 anthracnose, N.Y.Cornell 61.
 propagation, N.Y.Cornell 57.
 seeds, dormancy in, 189.
- Soaps, effect on lead arsenate in spray mixtures, 74.
- Social—
 activities of families in older rural area of State, Pa. 614.
 organization, rural, in Washington County, Ark. 745.
 sciences, collegiate mathematics needed in, 600.
 trends, rural, treatise, 299.
- Sociology, rural, papers on, 301.
- Sod insects, naphthalene as fumigant, 830.
- Sodium—
 arsenite, efficiency against stomach worms, 717.
 bicarbonate for growing gilts on pasture, 405.
 bicarbonate, toxicity in Burgundy mixture, N.H. 373.
 chlorate for weed control, 797; Ohio 38.
 chlorate-limestone mixtures for weed control, Ohio 38.
 chlorate mixtures as herbicides, fire hazards from, 797.
 fluoride poisoning, accidental, 235.
 fluosilicate, efficiency against stomach worms, 717.
 fluosilicate for *Locusta migratoria migratorioides*, 238.
 hydroxide, effect on cystine, 483.
 hydroxide, germicidal efficiency, 423.
 in blood serum, determination, 331.
 nitrate and ammonium sulfate on lawns, comparison, R.I. 200.
 silicate solutions, colloidal properties, 323.
 sulfate, toxicity in Burgundy mixture, N.H. 373.
- Soil—
 acidity and commercial fertilizers, N.J. 24.
 acidity and liming, R.I. 178.
 acidity as phytopedological factor, 18.

Soil—Continued.

- analysis, mechanical methods, 283.
- analysis, rapid methods, 490.
- animals and root disease in Puerto Rico, 535.
- bacteria and fixation of atmospheric nitrogen, 500.
- bacteria, effect of ultraviolet rays, 343.
- blowing, control, Kans. 201.
- chemists, East African, conference proceedings, 335.
- chisel, notes, Ohio 116.
- colloids, *see* Colloids.
- constants, single value, significance, 337.
- deficiencies, Winogradsky spontaneous culture method for determining, Iowa 498.
- erosion—
 - and land use, 601.
 - and moisture conservation control plats, type of divisor box for, 721.
 - and surface run-off, factors affecting, Mo. 118.
 - and tree planting, Ohio 58.
 - control by terracing, 438.
 - control in central Oklahoma, 497.
 - control, Mangum terrace demonstration, 159.
 - control, proposed system, 722.
 - factors affecting, 437.
 - in gullies, soil-binding plants for, U.S.D.A. 59.
 - index variants, 874.
 - prevention by Mangum terraces, Ind. 116.
 - studies, Kans. 179, 281; Wis. 874.
- fertility—
 - effect of *Bacillus mycoides*, 779.
 - effect of irrigation, Idaho 871.
 - losses, Mo. 779.
 - studies, Idaho 776; Ind. 37; Kans. 179.
- formation in southern Nigeria, 335.
- fumigants, Calif. 71.
- heaters, Calif. 116.
- laboratories, petrographic methods for, U.S.D.A. 15.
- moisture—
 - conservation, Kans. 201, 281.
 - draft of corn and alfalfa on, Nebr. 512.
 - effect on hardening process in alfalfa, 354.
 - in orchards under different fertility experiments, 800.
 - notes, Oreg. 354.
- movement under test load, 118.
- physics division, report, Hawali 635.
- profile, movement and translocation of constituents, 179.
- profiles, podsol, microbiological studies, 495.
- profiles of drift soil, genesis and development, 334.

Soil—Continued.

- reaction studies, Fla. 178.
 - reconnaissance of Toole, Liberty, and Glacier Counties, Mont. 778.
 - science, quarter century progress in, 14.
 - solution, relation to ion concentration, Kans. 179.
 - survey in—
 - California, Oceanside area, U.S.D.A. 777.
 - California, San Luis Obispo area, U.S.D.A. 333.
 - Georgia, Hart Co., U.S.D.A. 777.
 - Georgia, Worth Co., 777.
 - Idaho, Gooding area, U.S.D.A. 777.
 - Iowa, Calhoun Co., U.S.D.A. 334.
 - Maryland, Caroline Co., U.S.D.A. 15.
 - Maryland, Kent Co., U.S.D.A. 334.
 - Maryland, Talbot Co., U.S.D.A. 15.
 - Massachusetts, Franklin Co., U.S.D.A. 179.
 - Massachusetts, Hampden and Hampshire Counties, U.S.D.A. 15.
 - Mississippi, Hancock Co., U.S.D.A. 777.
 - New Mexico, Fort Sumner area, U.S.D.A. 334.
 - New Mexico, Rincon area, U.S.D.A. 777.
 - New York, Suffolk and Nassau Cos., U.S.D.A. 333.
 - Ohio, Ottawa Co., U.S.D.A. 15.
 - Wyoming, Basin area, U.S.D.A. 179.
 - surveys in western Canada, methods and scope, 320.
 - temperature, effect of soil mulch, 339.
 - temperatures and evaporation in paper birch-white pine forest, 58.
 - testing, practical system, Mich. 328.
 - tests, colorimetric, modification, Wis. 776.
 - types, differential response to calcium arsenate, 187.
 - types of North Carolina, value for different crops, N.C. 179.
 - types, rate of decay in, and vegetative covering in Glamorgan, 338.
 - utilization and land-appraisal index, Calif. 16.
 - utilization tests, Ga.Coastal Plain 16.
 - water, *see* Soil moisture.
- Soils—
- acid, *see* Soil acidity.
 - alkali, *see* Alkali.
 - alkaline calcareous, phosphate availability in, 499.
 - ammonification, *see* Ammonification.
 - base exchange capacity, use of dihydrogen potassium phosphate in study, 490.
 - biochemical processes, effect of clover culture, 183.

Soils—Continued.

- calcareous alkaline, available phosphorus in, method for estimating, Colo. 328.
- caliche type of calcareous hardpan in, 180.
- capacity to supply phosphoric acid to plants, methods for estimation, 328.
- carbon dioxide diffusion through, 496.
- carbon-nitrogen ratio and nitrate formation in, effect of organic matter, 182.
- chlorides in, electrometric determination, 12.
- citric acid extracts, phosphorus determination in, 174.
- composition, effect of green manure, Fla. 178.
- dry, changes in volume when wetted with water and with chemical solutions, 18.
- East Anglian, exchangeable bases, 336.
- examination methods, 14.
- fertilizer needs, Neubauer method for determining, Ind. 16.
- heating by electricity, 287; Ind. 116.
- lime requirements, effect of seasonal variation of pH in, 503.
- measurement of size frequency distribution in, Ohio 17.
- movement of fertilizers in, 184.
- muck, *see* Muck soils.
- nitrogen content, *see* Ammonification, Nitrification, and Nitrogen.
- of Everglades, effect of fertilizers and special elements in, Fla. 178.
- of Ford County, Ill. 778.
- of Iowa, plant food content and lime requirements, Iowa 16.
- of Jackson County, Ill. 778.
- of Kansas, replaceable cations and anions, Kans. 179.
- of Kentucky, phosphates in, 181.
- of Massachusetts, mineral deficiencies, determination, Mass. 635.
- of the Trans Nzoia, 335.
- of western San Diego County, classification and evaluation, Calif. 635.
- orchard, phosphorus distribution and acidity, Ohio 21.
- organic matter in, *see* Organic matter.
- oxygen absorption in, 338.
- peat, *see* Peat.
- pH in, seasonal variation, effect on lime requirements, 503.
- pH value, effect of sulfur or lime, Del. 16.
- physical condition, effect of sorghum residues, Calif. 37.
- physical properties of interest to agricultural engineers, 282.
- rebuilding in central Oklahoma, 497.
- relation to fruit growing in New York, N.Y. Cornell 53.
- relation to grain growing in thirteenth century, 320.

Soils—Continued.

- solid phase, solubility in water, 18.
- sterilization by electricity, 598.
- studies, Calif. 16; Iowa 16; Nebr. 495; Oreg. 339.
- subsoil variation, root as indicator, 188.
- sugarcane, studies, 516.
- temperature of air layers near, 14.
- tropical, single value soil properties, 17.
- under fertilizer and crop control, base-exchange modifications, 19.
- Soil-subsoil, 6-foot column, base interchange induced by nitrates in, 18.
- Solanum* spp., hybridization experiments, 521.
- Solar activity, secular periods, U.S.D.A. 775.
- Solar radiation, twenty-nine months of, at Tucson, Arizona, U.S.D.A. 177.
- Solenopsis geminata*, *see* Fire ants.
- Solids, wetting by liquids, 323.
- Solutions, nutrient, *see* Culture media.
- Sorghum—
 - and sugarcane hybrids, 517.
 - feeding value for dairy cows, V.I. 572.
 - grain, breeding, Calif. 37; Kans. 200.
 - grain, culture experiments, Kans. 200.
 - grain, drought resistance, U.S.D.A. 644.
 - grain, for harvesting with combine, culture, Kans. 514.
 - grain, irrigation requirements, Kans. 200.
 - grain, keeping quality, effect of moisture in, Kans. 200.
 - grain, variety tests, Fla. 199; Kans. 200; N.Mex. 200; V.I. 512.
 - inheritance of waxy endosperm in, 784.
 - planting, Kans. 201.
 - resistance to insect injury, Kans. 232.
 - seeds, microphotography, 363.
 - varieties, new, Okla. Panhandle 45.
 - webworm, Mo. 79.
 - yield and dependability, Okla. Panhandle 790.
- Sorghums—
 - for grain and forage, Okla. 205.
 - grain, harvesting with combine, Kans. 281.
- Sorgo—
 - Atlas, feeding value, Kans. 701.
 - culture experiments, Kans. 200; Nebr. 512.
 - fodder and sorgo silage, comparison for milk and butterfat production, Kans. 257.
 - irrigation requirements, Kans. 200.
 - silage and fodder, comparative nutritive value, Kans. 248.
 - varieties, Okla. 205.
 - variety tests, Fla. 199; Iowa 37; Kans. 200; N.Mex. 200; V.I. 512.
- South Carolina Station, notes, 480.
- South Dakota College, notes, 623.
- South Dakota Station, notes, 623.
- Sowbugs, control, 548.

Sows—

Berkshire, basal energy requirements, N.H. 406.

brood—*see also* Pigs.

feeding and management, Alaska 88.

winter rations, Del. 89; Oreg. 407.

pregnant, mineral requirements, 255.

Soybean—

diseases, Del. 60.

flour for cakes and muffins, 892.

hay as source of vitamin A, Ind. 98.

hay, machine dried v. field cured, for beef steers, 405.

hay yields, variation in experimental plats, 198.

meal and ground soybeans, relative feeding value, Ohi. 99.

meal as source of protein in poultry ration, Wis. 839.

meal for chicks, feeding value, N.H. 406.

meal, nitrification, Mass. 634.

milk in infant feeding, 305.

oil, characteristics, 4.

paste as emulsifying agent, 748.

Soybeans—

and corn for silage, N.Y.Cornell 202.

and corn, interplanting, Ohio 39.

and wheat, feeding value for swine, 405.

as soil improvement crop, Kans. 179.

breeding, Ga. 199; Ind. 37; Iowa 37; Kans. 200.

culture experiments, Ga.Coastal Plain 37; Kans. 200.

effect of inoculation and liming, Iowa 515.

ensiled during three consecutive years, chemical study, 563.

feeding, effect on milk and butterfat production, Ind. 98.

fertilizer experiments, N.H. 353.

for hay and seed, Ind. 789.

for pigs, limitations, Ohio 90.

for silage, Fla. 257.

genetics, 192.

green, as forage for hogs, S.C. 254.

ground, and soybean oil meal, relative feeding value, Ohio 99.

ground, effect on cold storage quality of eggs, 846.

ground, for poultry, Del. 89, 846.

harvesting tests, Kans. 200.

nutritive value, 405.

nutritive value and mineral deficiencies, Ind. 89.

v. alfalfa hay for milk and butterfat production, Kans. 257.

value of crop, U.S.D.A. 644.

varieties, differences in amino acid content of glycinin, 4.

varieties, oil content, 4.

varieties, suitability for hay, Ind. 98.

variety-date-of-planting tests, Fla. 199.

variety on peat land, Minn. 201.

Soybeans—Continued.

variety tests, Ga. 199; Ga.Coastal

Plain 37; Hawaii 643; Idaho 788;

Iowa 37; Kans. 200; Mass. 643;

Mich. 158; N.H. 353; N.Mex. 200.

Sparrows—

English, sex characters in, control, 788.

song, sex relations, 682.

Spermatogenesis in mice, 35.

Spermatozoa, mammalian, improved fluid for suspensions, 35.

Sphacelotheca—

cruenta, physiologic forms, Kans. 222.

sorghii, physiologic forms, Kans. 222.

Sphaeropsis malorum, notes, 540.

Spider mite, *see* Red spider.

Spinach—

canned, vitamin C in, stability relation to copper content, 153.

culture and handling, Ill. 52.

effect of rye and oat straws, 183.

hemoglobin regenerating potency, 473.

transmission of cucumber mosaic to, 671.

varieties, 211.

viruses affecting and insect transmission, 671.

Spindle worm, biology and morphology, U.S.D.A. 389.

Spirillum fetus, cause of outbreak of abortion in sheep, 717.

Spirochaeta morsus muris, arsenic refractoriness, 421.

Spirochetosis—

icterohemorrhagic, experimental, 590.

of fowls, ducks, and geese, 580.

Spray—

chemicals, feeding to albino rats, effect, Mo. 552.

for insect control in empty grain bins, 824.

materials, Del. 60; Mass. 652.

outfits, stationary, place in Virginia, 386.

plants, stationary, in Georgia, 599.

plants, stationary v. portable, Ind. 48.

residues—
arsenical, on apples in Pacific Northwest, 684.

arsenical, removal from apples, 684.

lead in, qualitative detection, 493.

on vegetables, 210.

problem, 384; Mass. 686.

reduction, N.H. 385.

removal, Oreg. 364.

removal from apples, Ind. 798.

systems, stationary, improvements in, 440.

Spraying—

experiments, Nebr. 520.

experiments in New Zealand, 549.

for diseases and insects, Kans. 212.

for scab and codling moth, success and failure in, Mich. 212.

stationary and portable methods, power consumption, Ind. 116.

Sprays—see also Fungicides, Insecticides, and specific forms.

copper, see Copper.

for cattle flies, methods of testing, 75.

oil, see Oil sprays.

Spruce—

Adirondack, sustained yield, 217.

and fir land, removal of hardwoods, value, Mich. 525.

areas, losses from logging operations, Mich. 59.

plantations, *Phacidium* blight in, spread and control, 380.

reproduction, relation to direction of exposure, 808.

sawfly, yellow-headed, notes, 548.

seedlings, effect of soil reaction, 370.

Sprue, etiology, possible factor in, 687.

Sprue-like symptoms in dogs, effect of vitamin G-deficient diets, 470.

Spurge, leafy—

life history and habits, N.Dak. 364.

spread and control, Iowa 38.

Squashes—

improvement by selection, Mass. 652.

thinning and fertilizer needs, N.H. 364.

vitamin A in, 617.

Squirrels—

fluctuations in numbers, 543.

notes, Kans. 232.

Stables, dairy, temperatures in, 441.

Standard of living—

measuring, inadequacy of cost of living figures, 443.

of farmers, effect of children, Wis. 889.

scales for measuring, 745.

Staphylococcus spp. causing arthritis in turkeys, 115.

Starch—

and its derivatives, 323.

colloid chemistry, 323.

in potatoes, effect of potash, 647.

in young orange trees, 806.

types, principal anions and cations, Hawaii 633.

Starches, stiffness produced in fabrics by, 764.

Starlings, European, in Michigan, Mich. 621.

Statics, graphic, treatise, 119.

Steam sterilization, electric, for dairies, 598.

Steel—

stainless, resistance to corrosion by orange juice, Calif. 3.

structures, analysis and design, 875.

Steers—see also Cattle, beef.

feeder, body shape, relation to various factors, 252.

feeding experiment, N.Mex. 249.

wintering on peanut hay alone, Fla. 248.

Stephanurus dentatus—

in northern United States, 268.

resistance of eggs and larvae, 590.

Stereum—

necator, notes, 539.

purpureum, notes, 537.

sulcatum, notes, 824.

Sterility in—

domestic animals, treatise, 33.

plants and animals, treatise, 33.

Stilbella theae, notes, 526.

Stilpnotia salicis, see Satin moth.

Stink bug—

green, economic status, 689.

southern green, notes, Fla. 231.

Stock, see Livestock.

Stock foods, see Feeding stuffs.

Stockyards fever, see Septicemia, hemorrhagic.

Stomach worms—

in cattle, status, P.R. 105.

in lambs, control, Ind. 104; N.C. 859.

in sheep, treatment, 276, 717.

Stomata of leaves, examining, ultrapaque microscope equipment for, 799.

Stomatal openings in gray birch, effect of 1932 eclipse, 343.

Stoves, electric, utensils for, Wash. 908.

Strangles streptococci infection, protective value of strangles bacterin, 592.

Straw itch mite, notes, 396.

Straw mulch, effect on vegetables, Nebr. 521.

Strawberries—

breeding, Conn.State 209.

canned, vitamin C in, stability relation to copper content, 153.

Cato, Clermont, and Culver, description, N.Y.State 367.

Dorsett and Fairfax, descriptions, U.S.D.A. 56.

fertilizer and tillage experiments, N.C. 56.

fertilizer experiments, Md. 652; N.H. 364.

fertilizer requirements, Oreg. 365.

for West Virginia farms, W.Va. 659.

frozen, retention of vitamin C in, Mass. 747.

fruit bud formation, Mass. 652.

Narcissa, notes, U.S.D.A. 56.

planting, N.J. 523.

rest period in, photoperiodism as cause, 659.

varieties, Ohio 49.

variety tests, Ga.Coastal Plain 48; Mass. 652.

vitamin C in, 891.

Strawberry—

and raspberry bud weevil, 72.

fruit rot, notes, 539.

gold leaf, notes, Mass. 663.

ice cream, off-flavor in, control, 707.

ice cream, retention of vitamin C in, Mass. 747.

industry, economic problems, 737.

leaf roller, notes, Kans. 232.

leaf roller parasites, Md. 686.

pest, new, 824.

root infection, Del. 60.

Strawberry—Continued.

- roots, decay, cause, Fla. 221.
- seedlings, new varieties, 212.
- virus disease, studies, 676.
- wilt or crown rot, notes, Fla. 221.

Stream pollution by irrigation residues, 117.

Streptococci—

hemolytic—

- human and equine strains, studies, 424.

- lactic acid production by, 487.

- serological differentiation, 581.

- in freshly drawn milk, 855.

Streptococcus—

- agalactiae* and *S. equi*, differentiation, 719.

- agalactiae*, notes, 274, 429, 715.

- citrovorus* and *S. paracitrovorus*, products formed by, Iowa 98.

- epidemicus*, use of term, 714.

- equi* and *S. agalactiae*, differentiation, 719.

- equi*, notes, 714.

- fecalis*, notes, 274.

- filter-passing strain, from a case of bovine mastitis, 430.

- infections, milk-borne, epidemiology, 709.

- mastitidis*, relation to other streptococci, 274, 429, 715.

- mitis*, notes, 274, 429, 715.

- paracitrovorus* and *S. citrovorus*, products formed by, Iowa 98.

- salivarius*, notes, 274.

- types and strains associated with mastitis, 429.

Striga spp., control on sugarcane, 534.

Strongylidosis in horses, treatment, 277.

Strongyloides from primate and human hosts, 869.

Strongylosis, equine, treatment, 105.

Strongylus infestation in horses, 405.*Strongylus* spp., *n*-butylidene chloride for, 106.

"Struck" of sheep on Romney Marsh, 716.

Structural frames, continuous, of reinforced concrete, treatise, 120.

Structures, stresses in, treatise, 120.

Strymax, study of genus, 390.

Students entering college, physical unfitness in, 306.

Subsoil, colloidal fraction, Del. 16.

Subulura strongylina, notes, 268.

Sucrose in plant extracts, determination, 174.

Sudan grass—

- breeding, Calif. 37.

- culture, Ohio 45.

- feeding value, U.S.D.A. 413; V.I. 572.

- hay yields, variation in experimental plats, 198.

- pasture, test, Ohio 99.

- seed bed preparations, Kans. 200.

Sugar beet—see also Beet.

curly top—

- breeding for resistance to, N.Mex. 200.

- resistance and test of U.S. No. 1 variety, U.S.D.A. 818.

- resistant varieties, Idaho 824.

- transmission to ornamental flowering plants, U.S.D.A. 677.

- leaf spot, pathogenicity, host response, and control, Iowa 60.

- pulp, artificially dried and pressed, feeding value, 258.

- seed, annual production, N.Mex. 200.

- seed, production in southern New Mexico, N.Mex. 362.

Sugar beets—

- culture experiments, Iowa 37; Nebr. 512.

- diseases, relation to *Cercospora* leaf spot, Iowa 60.

- fertilizer experiments, U.S.D.A. 789.

- irrigation requirements, Kans. 200.

- resistant to *Cercospora* leaf spot, breeding, Iowa 60.

- rotation experiments, U.S.D.A. 789.

- seedling stands, effect of fertilizers, Ohio 38.

- thinning test, U.S.D.A. 789.

- variety tests, 201.

- yield, in different rotations and on different preparations, Ohio 38.

Sugar—see also Sugars.

- house machinery and methods, 517.

- in blood, See Blood sugar.

- industry, colloid chemistry in, 323.

- industry of Puerto Rico, 516.

- industry, South African, agricultural practice in, 515.

- Philippine, probable effects of a United States tariff on, 607.

- policy of British Empire, 295

- raw, feeding value for hogs, Hawaii 698.

- tariff on, 448.

- terms in twelve languages, dictionary, 361.

Sugarcane—

- and sorghum hybrids, 517.

borer—

- biological control, 556.

- control by *Trichogramma* colonization, 81, 836; La. 80.

- in south Florida, control, Fla. 232.

- parasite, most important, biology, 244.

- parasites in Argentina and Peru, introduction into United States, U.S.D.A. 692.

- parasites in Barbados, 548.

- breeding, Fla. 199; V.I. 512.

- breeding in different countries, 517.

- crystallization, symposium, 517.

- cyanamide as source of nitrogen, La. 648.

- cytology, 785.

Sugarcane—Continued.

- diseases, P.R. 810.
- diseases and culture, papers on, 515, 534.
- experiments, P.R. 790.
- fertilizer experiments, Fla. 199.
- fertilizer requirements, 45.
- gumming disease, 225.
- mosaic—
 - artificial transmission, 672.
 - changes induced in cells by, 226.
 - notes, 526, 535.
 - relative resistance of native and imported varieties, P.R. 67.
 - varietal resistance to, Fla. 221.
- mottling disease, *see* Sugarcane mosaic.
- pests, biological control, 384.
- pokkah boeng, notes, 534.
- pollen fertility, relation to anther color, 796.
- quarantine, protective, report, 535.
- ratoon, cultivation under unirrigated conditions, 122.
- red stripe disease, 535.
- research in Hawaii, 206.
- root borer at the Isabela Substation, P.R. 825.
- root borer, control, 548.
- rot and bacterial diseases, 535.
- seedlings, damping-off control, Fla. 221.
- studies, P.R. 39.
- Technologists, International Society, proceedings, 515.
- varieties resistant to gumming disease, 535.
- variety P.O.J., relation to insect damage, 550.
- variety P.O.J. 213, behavior, 535.
- variety P.O.J. 2878, composition and chemical behavior of juice, P.R. 3.
- variety tests, Fla. 199; V.I. 512.
- yellow stripe, *see* Sugarcane mosaic.

Sugars—*see also* Glucose, Sucrose, *etc.*

- in plant extracts, determination, 174.
- in solutions, response of corn ear worm moths to, 80.

Sulfate—

- of ammonia, *see* Ammonium sulfate.
- waters, concrete exposed to, action, tests, U.S.D.A. 725.

Sulfhydryl concentration, relation to size inheritance in rabbits, 509.

Sulfite, action on cystine, 165.

Sulfur—

- as fungicide, action, 372.
- colloidal, toxicity and its enhancement, Ohio 61.
- compounds, effect on potato tubers, 341.
- economy of animal fiber production, 315.
- effect on Merino sheep and their resistance to potassium cyanide poisoning, 420.
- fungicides applied during bloom, effect on set of apple fruits, 802.

Sulfur—Continued.

- in phosphate rock, 487.
- in proteins, 483.
- Koppers flotation, test for apple scab control, 821.
- lability in cysteine, mechanism, 4.
- mixtures, *see* Lime-sulfur.
- molten, effect on wood decay, Ark 875.
- spray materials, new types, v. liquid lime-sulfur, Wis. 810.
- Sumac, laurel, source of red scale infestation of citrus, 77.
- Sun spot period, 11-year, U.S.D.A. 775.
- Sun spots, relation to weather, 175.
- Sunflower—
 - diseases, control methods, 222.
 - weevil parasites, 696.
- Sunflowers, germination and growth, effect of pH, 188.
- Sunlight—*see also* Light.
 - ultraviolet component, daily measurement, 620.
- Sunshine—
 - of New Orleans, antirachitic efficiency, 313, 474.
 - of New Orleans, efficiency for chicks, 410.
 - through window glass, effect on resistance to infection, 313.
 - winter and summer, in Albany, N.Y., antirachitic potency, 313, 314.
- Superphosphate, fertilizing value, *see* Phosphates, comparison.
- Superphosphates, application to apples and peaches, Calif. 47.
- Supply curves, statistical, nature, 443.
- Suprarenal—
 - cortex and vitamin C, 904.
 - glands, hexuronic acid from, vitamin C activity, 10.
- Surra in equines, treatment with Bayer 205, 861.
- Susliks, temperature regulation, 248.
- Suspensoids and their electrical precipitation, 323.
- Swallow, G. C., memorial tablet to, 623.
- Swede bulbs, sampling by cores, 649.
- Swedes—
 - for livestock, culture and harvesting, U.S.D.A. 354.
 - palatability, vitamins in, effect of storage, Mont. 899.
 - value of field trials, 644.
 - variety tests, 201; Oreg. 354.
- Sweet corn—*see also* Corn.
 - anticalcifying factor in, development and destruction, Wis. 890.
 - bacterial wilt, developing resistance to, Ind. 60.
 - bacterial wilt, notes, N.J. 373.
 - breeding, Conn.State 209; Fla. 199; Iowa 48.
 - breeding and improvement, P.R. 49.
 - fertilizer and liming tests, Me. 364.
 - Golden Cross Bantam, description, U.S.D.A. 653.

Sweet corn—Continued.

- improved sorts, Md. 643.
- improvement by selection, Mass. 652.
- selection and breeding to reduce suckers, N.Y. Cornell 50.
- varieties, sugar content, Mass. 652.
- variety and strain tests, Me. 364.
- variety tests, Fla. 199; Md. 643; R.I. 210.

Sweet peas for all purposes, treatise, 524.

Sweetclover—

- as soil improvement crop, Kans. 179; N.J. 207.
- biennial, eradication, Iowa 38.
- breeding, Idaho 788; Kans. 200.
- brown root rot, notes, 535.
- culture experiments, Oreg. 354.
- disease, cause, 581.
- diseases, control methods, 222.
- fertilizer experiments, N.H. 353.
- for sheep, U.S.D.A. 839.
- hay, moldy, effect, 579.
- liming tests, Kans. 200.
- pasture, improvement, Idaho 838.
- pastures, earlier availability, 406.
- production, factors affecting, Wyo. 791.
- seed bed preparation, Kans. 200.
- seed, persistence of viability in cultivated soil, 362.
- spring growth, composition, 207.
- variety tests, Alaska 36; Kans. 200; Oreg. 354.

Sweetpotato—

- beetle, two-striped, biology and control, 84.
- root rot, notes, U.S.D.A. and Tex. 528.
- seed bed troubles, soil disinfectants for, Del. 60.
- seed stock, disease-free, propagation, Iowa 60.
- stem rot, control, Kans. 222.
- weevil, control, 548.

Sweetpotatoes—

- color inheritance in, Ga.Coastal Plain 37.
- culture experiments, Ga.Coastal Plain 37.
- dry lot feeding and grazing of pigs, Fla. 248.
- feeding value, 406; Hawaii 698.
- fertilizer experiments, Del. 37; Ga. 199; Ga.Coastal Plain 37.
- formaldehyde as disinfectant, 226.
- hogging-off and feeding, La. 408.
- Indiana, marketing, Ind. 885.
- Nancy Hall, vitamin A and B in, 756.
- Puerto Rican, vitamins B and C in, Ga. 308.
- spacing tests, Ga. 199.
- storage and fertilizer tests, Iowa 38.
- storage experiments, Del. 37; V.I. 512.
- variety tests, Ga.Coastal Plain 37; Hawaii 643; V.I. 512.
- vitamin A in, effect of fertilizers, Iowa 148.

Swelling of two-phase systems, effect of elasticity and permeability, 323.

Swine—see also Pigs.

- Berkshire, inbreeding, Calif. 88.
- bone and tooth composition, effect of fluorine, 843.
- breeding, selection, production tests for, 405.
- erysipelas—
 - diagnosis, 276.
 - effect on swine production, 276.
 - in New York State, 432.
 - in Saskatchewan, 432.
 - serum, protective dose, 590.
- fattening, southern proteins for, comparison, 406.
- leg stiffness in, relation to barley, Calif. 88.
- performance record, litter comparisons, Iowa 93.
- 60-day fasts in, Mo. 95.
- studies, Iowa 89; Ohio 90.

Symptomatic anthrax, see Blackleg.

Synchytrium—

- endobioticum* in susceptible and resistant potato varieties, relations, 816.
- fulgens*, sexual reproduction in, 62.

Syneta albida as cherry pest, control, 396; Oreg. 396.

Syngamus indicus, new nematode from Indian elephant, 420.

Synthetocaulus leporis, notes, 382.

Syracuse University, College of Agriculture, discontinuance, 320.

Tabanus—

- atratus*, see Horsefly, black.
- spp., dragon flies predacious on, 243.
- trimaculatus*, life history, 243.

Tachypterellus quadrigibbus, see Apple curculio.

Taenia taeniaeformis in rats, protection, 426.

Taeniothrips—

- gladioli*, see Gladiolus thrips.
- inconsequens*, see Pear thrips.

Tanaostigma haematowylei n.sp., description, 72.

Tankage—

- for fattening cattle, 405.
- v. dried caplin fish as protein supplement for swine, 406.

Tapeworm, fowl, development in slug, 544.

Tapeworms—

- in cattle and goats, status, P.R. 105.
- in poultry, slugs as intermediate host, 544.
- in rats, protection by serum from immune rats, 426.
- test of treatments for, 717.

Taphrina pruni, notes, 537.

Tapioca flour, feeding value for pigs, 566.

Tar distillate sprays—

- for codling moth control, 237.
- for fruit aphids, tests, 236.
- for San Jose scale, efficiency, 239.

Tariff and market of flaxseed, Mont. 606.

- Tariffs, effect on farm prices and adjustments, Iowa 603.
- Tarnished plant bug—
control, N.Y.Cornell 72.
in Ottawa, overwintering habits, 547.
injury to celery, 77.
on tobacco, Conn.State 550.
varietal resistance of plants to, 71.
- Taros, fertilizer experiments, P.R. 39.
- Tarsonemus hydrocephalus*, cause of red-burn of amaryllis, 822.
- Tarsonemus pallidus*, see Cyclamen mite.
- Tartar emetic as poison for tobacco and tomato worms, 78.
- Tax—
delinquency on rural land in Missouri, 739.
primer of University of Nebraska, Nebr. 136.
reduction, possibilities, Okla. 737.
revenue for roads by different levying jurisdictions, Ohio 128.
- Taxation—
farm, Me. 444.
farm, amount of wheat required for, Ohio 127.
farm, in Louisiana, La. 886.
farm, trends, Ohio 128.
in Maryland, Md. 446.
programs of adult study, 443.
relation to land use, 601.
studies, Del. 889.
- Taxes—
cause of agricultural distress, 443.
State and local, revision in Colorado, Colo. 135.
- Tea—
Armillaria root disease, 540.
diseases, parasitic, in the Orient, 822.
stem canker, cause, 555.
yellows, cause and control, 526.
- Teeth—
decay, effect of high carbohydrate and extremely low fat diet, 475.
decay, studies, 475.
mottled enamel in, experimental production, Ariz. 155.
mottled, occurrence in Iowa, 620.
- Telenomus*—
alecto, notes, U.S.D.A. 692.
heliothides, notes, 242.
spp., notes, 689.
- Temperature—see also Climate and Soil temperature.
effect on hardening process in alfalfa, 354.
measurement, errors in, 284.
methods of regulation, 233.
of air layers near soil, 14.
of Oregon, U.S.D.A. 333.
relation to plum curculio in apples, 245.
- Temperature-humidity chamber, Stoughton constant, modification, 547.
- Tenodera*—
angustipennis, new in United States, 238.
sinensis, see Chinese mantis.
- Tent caterpillar, eastern, chemical changes during life cycle, 389.
- Tepary bean hay v. alfalfa hay for heifers, Okla.Panhandle 573.
- Teredo*, timbers resistant to, 247.
- Termites—
association with fungi, 553.
damage on woody cuttings, prevention, 826.
dry-wood-inhabiting, role in sprue, 687.
dry-wood, notes, Fla. 231.
of western Mexico, 237.
water-and-oil treatment against, 826.
- Testes—
germinal tissue, destruction by X-rays, effect on cocks, 35.
postnatal growth, 352.
- Testicular hormone—
assay, castrated rats for, 351.
effect of freshness of testes and of desiccation of testicular tissue, 352.
effect on spontaneous activity in male rats, 35.
preparations, assay, 351.
quantitative indicators in rats, 512.
response of castrated male rats to injection, 351.
- Tetany, calcium and phosphorus content of brain in, 155.
- Tetrameres*—
americana, distribution in New Jersey, 864.
crami n.sp., description, 437.
paradisea n.sp. from Stanley cranes, 420.
pattersoni n.sp. from bobwhite, 268.
- Tetranychus*—
medanieli, notes, 247.
telarius, see Red spider.
- Tetrastichus*—
crassinervis, notes, 247.
haitiensis, notes, P.R. 825.
- Texas fever, see Piroplasmosis, bovine.
- Texas fever tick, see Cattle tick.
- Texas Station—
abstracts of publications, 621.
notes, 912.
- Textile—
fibers, quantitative chemical estimation, 475.
materials, colloid aspects, 315.
materials, sizing and finishing, 323.
- Thallium, toxicity, distribution, and excretion, 436.
- Theelin—
effect on immature guinea pigs, 352.
injections, attempted induction of labor by, 353.

Theelol—

administration to immature pullets, effect, 198.

purification and constitution, 484.

Theileria mutans in northern Queensland, 867.

Thelohania ephestiae, cause of disease of Mediterranean flour moth, vector of, 247.

2-Thiohydantoins, preparation, 485.

Thionine, effect on agglutinin titer in abortion infected cows, 108.

Thistle, Canada, control, Ohio 38.

Thosea sinensis, life history, habits, and control, 556.

Threshing machines, studies, Ohio 116.

Thripoctenus russelli, notes, Calif. 827.

Thrips—

imuginis, control, 553.

tabaci, see Onion thrips.

Thylodrias contractus, notes, 232.

Thymonucleic acid, determination, 331.

Thyroid gland, effect of long continued injections of acid extract of anterior pituitary, 350.

Thysanoptera of Utah, food plants and distribution, 553.

Tick—see also Cattle tick.

fever, see Piroplasmosis, bovine.

new species from the Texas peccary, 267.

Tick-bite fever in children, transmission by dog tick, 400.

Tick-borne fever in Great Britain, causative agent, 590.

Ticks of East Indian Archipelago, 400.

Tikitiki extract—

analyses, 761.

vitamin B and G in, Hawaii 747.

Tillage—

electric, 122.

equipment, duty and cost, Idaho 871.

practices, Kans. 201.

Timber—see also Lumber and Wood.

decay, diagnosis, 542.

green, cause of shakes and rift cracks in, 661.

lands, utilization, N.H. 445.

of buildings, effect of fillers on wood-destroying fungi, 680.

resistance to wood-destroying fungi, effect of season of felling, 372.

Timbers resistant to *Teredo*, 247.

Time, use by rural homemakers, Mont. 477.

Timothy—

alfalfa, and clover mixture on meadows, tests, Ohio 38.

hay cut at different stages, N.H. 406.

hay cut at different stages, vitamins in, Ohio 90.

hay, effect of liberal nitrogenous fertilization, N.Y.Cornell 38.

hay for pregnant and nursing ewes, 406.

hay in winter ration of ewes, Ohio 90.

Tinea pellionella, see Clothes moth, case-bearing.

Tineola biselliella, see Clothes moth, webbing.

Tiphia parallela, notes, 686.

Tipula spp., control, 393.

Toad, giant—

distribution, life history, and habits, 70.

notes, P.R. 824.

Toads, poisonous secretions, 382.

Tobacco—

beetle, control in a library, 73.

black root rot, notes, Mass. 663.

Broadleaf, fertilizer experiments, Conn. State 518.

budworm, notes, Conn.State 550.

cigar leaf, experiments, Conn.State 518.

cigar, prices and acreages in United States, factors affecting, Conn.Storrs 607.

culture experiments, Ga.Coastal Plain 37.

cured, moth enemy, U.S.D.A. 690.

deficiency of certain essential elements, distinctive effects, U.S.D.A. 362.

downy mildew or blue mold, Fla. 221; U.S.D.A. 67.

effect of various minerals, 649.

experiments, Conn.State 207; P.R. 790.

exports from United States, 1920-32, Ohio 600.

fertilizer experiments, Fla. 199; Ga. Coastal Plain 37; Ind. 37.

flea beetle, control with barium fluo-silicate, 84.

frenching, field and laboratory studies, Va. 818.

in Deli, insects affecting, 550.

industry, American, competition in, 457.

insects affecting, 549; Conn.State 550.

kreopoek, two types, 673.

leaf disease, new in Rumania, 536.

leaves, organic acids, effect of curing process on, Conn.State 771.

mosaic—

effect on anatomy of host plant, 819.

plant juice, double refraction exhibited by, 673.

virus and tomato spotted wilt virus, inoculation experiments, 672.

virus, movement in host, 673.

virus, properties, 819.

virus, rod-shaped particles in, 673.

nicotine in, Hawaii 633.

nitrogen distribution in, 207.

pathology, 226.

plant beds, treatment, Ohio 38.

powder for prevention of enterohepatitis in turkeys, Kans. 249.

production in Union of South Africa, 450.

research, Mass. 643.

root knot, notes, Ga.Coastal Plain 60.

Tobacco—Continued.

- root rots, black and brown, Mass. 663.
- seed beds, formaldehyde dust for, Ohio 61.
- seed beds, midge larvae in, control, 232.
- seed, germination studies, Fla. 199.
- seed, structure and germination and anatomy of seedling, 796.
- shade curing experiments, Conn.State 519.
- thrips, control, Conn.State 550.
- variety tests, Ga.Coastal Plain 37; V.I. 512.
- White Burley, composition and quality, effect of potash treatments, Ky. 45.
- wild fire in Yamaska Valley, eradication, 673.
- worm, tartar emetic as poison for, 78.

Tomato—

- bacterial canker, notes, Ind. 60.
- black spot, control, Fla. 221.
- blossom-end rot, notes, N.J. 373.
- diseases, N.Mex. 222.
- diseases, control in seed bed, Ga. 221.
- diseases, virus, Ind. 60.
- diseases, virus, relation to stripe disease of British Isles, 820.
- juice, canning without vitamin C loss, 619.
- juice, sterilization with heat developed by resistance to alternating electric current, Iowa 143.
- leaf mold, control, 226.
- mosaic, notes, Md. 663.
- mosaic, studies, 226, 227.
- mutant, thread-leafed, genetics, 29.
- nail head blight, spraying for, Ga.Coastal Plain 60.
- nail head spot, studies, Fla. 221.
- pin worm, description and injury, 80.
- plants, amylase and invertase activity, factors affecting, Ind. 48.
- plants, mineral constituents, effect of variations in nutrient media, Ark. 781.
- pomace, dried, in dairy rations, Del. 98.
- seedling diseases, control, Del. 60.
- spotted wilt virus and tobacco mosaic virus, inoculation experiments, 672.
- stripe disease, relation to mosaic, 820.
- Verticillium* wilt, notes, Wis. 810.
- wilt, control, Fla. 221.
- wilt, studies, Ga. 221.
- worm, tartar emetic as poison for, 78.

Tomatoes—

- canned, effect of storage on vitamin A in, Iowa 148.
- canned, industry and distribution in United States, 743.
- canning, composition, Calif. 52.
- culture experiments, Ga.Coastal Plain 48.
- decoloration, ripening, and coloration with ethylene gas, 211.

Tomatoes—Continued.

- earliness and total yields, effect of fertilizers and rotation, N.Y.State 211.
- fertilization, effect of different ratios, Va.Truck 653.
- fertilizer experiments, Ga.Coastal Plain 48.
- Florida, grading, packing, and storing, Fla. 50.
- germination and growth, effect of pH, 188.
- greenhouse, effect of soil moisture, Ohio 49.
- greenhouse, fertilization, R.I. 210.
- growth, effect of electricity, 877.
- growth in sand, N.H. 364.
- hybridization experiments, 521.
- improvement, Calif. 48.
- Indiana, marketing, Ind. 48.
- insects affecting, N.Mex. 232.
- processed, effect of heating on color pigment, Ind. 48.
- resistant to *Cladosporium* leaf mold, N.Y.Cornell 61.
- root-stem transition region, vascular anatomy, 504.
- seed selection, Ind. 48.
- statistical data, R.I. 288.
- stored, pectin changes in, Iowa 48.
- tests, V.I. 520.
- tetraploid, from different origins, cytogenetic studies, 785.
- variations in, hereditary radium-induced, 508.
- varieties, yield, factors affecting, N.Mex. 210.
- variety tests, Ga.Coastal Plain 48.
- vitamin C in, 310.

Tonoszillograph, Plesch's, use, 579.

Tortricidae, life history, 392.

Toxascaris limbata, effect of rotenone, 423.

Tracheitis in poultry, Iowa 104.

Tracheomycoses, studies, 220.

Tractor—

- and horse power in wheat area, S.Dak. 286.
- engines, lubrication, 731.
- fuel studies, 731.
- fuels, tests, Mich. 597.
- tires, rubber, tests, 438.
- track efficiency, Iowa 116.
- wheels and tracks, efficiency tests, 438.

Tractors—

- depreciation in western Canada, 286.
- Diesel, operation, Idaho 871.
- farm, construction, operation, and repair, treatise, 122.
- rubber tires and steel wheels for, comparison, 875.
- small general-purpose, economic use, 875.
- tests, Nebr. 596.
- use, Iowa 116.

Trade—

- centers, farm, La. 141.
- overseas, of United Kingdom, 458.

Trade—Continued.

relations, town-country, of South Dakota, S.Dak. 301.

Transpiration—

experiments, 189.

in plants, 343.

rate of excised shoots of fruits, effect of pruning, 800.

Transportation—

and land use, 601.

problem, American, treatise, 604.

Tree—

fruits, bud sports in, field studies, Mich. 53.

growth and wheat yields in southern Saskatchewan, U.S.D.A. 178.

seeds, phytopathological studies, methods, 678.

species, value as fence post material, Conn.State 217.

workers, requirements for, Conn.State 157.

Trees—

and shrubs for the garden, treatise, 525.

canker disease, notes, N.Y.Cornell 61.

coniferous, *see* Conifers.

different species, effect on soil, 370.

evergreen, *see* Evergreens.

forest, landscape and windbreak tests, Fla. 209.

forest, pruning, 661.

forest, seed germination tests, peat mats for, 58.

forest, spacing and cultural requirements, Ga. 217.

forest, studies, Kans. 210.

growth, relation to soil characters, Conn.State 217.

hardwood, drought injury in Connecticut, 660.

hardwood, invasion in white pine area, 58.

hardwood, measurements, top diameter utilization limits for, 661.

living, activities of micro-organisms in, N.Y.Cornell 61.

mycorrhizas of, 637.

planting and soil erosion, Ohio 58.

practical surgery, treatise, 522.

season of felling, relation to wood-destroying fungi, 372.

shade and ornamental, insects affecting, 384.

shade, insects affecting, 76; Kans. 232.

shelter belt, tests, U.S.D.A. 807.

size in Sierra lumbering, economic significance, Calif. 59.

storm damaged, repairing, Mich. 526.

windbreak, establishment, Ind. 57.

Trematodes, occurrence in this country, 544.

Triatoma protracta, *Trypanosoma cruzi* from intestine, 425.

Tribolium—

confusum, *see* Flour beetle, confused.

ferrugineum, *see* Flour beetle, rust-red.

Trichinella spiralis—

encysted, effects of low temperatures, 591.

extracts, failure to immunize rats to trichinosis, 267.

human infection with, prevalence, 267.

in hogs, resistance to, 267.

Trichogramma—

colonization in Louisiana, 836.

mass production, technic, 234, 836.

minutum—

breeding methods in Connecticut, 246.

breeding, technic, 548.

colonization, 81; La. 80.

notes, 241, 242; Mo. 79; U.S.D.A. 692.

notes, 232; Conn.State 546.

Trichomonad disease of cattle and vaginal catarrh problem, 430.

Trichomonads, relation to abortion in cattle, 712, 713.

Trichomonas bovis—

description, 712.

notes, 713.

Trichostrongylus—

axei in New York State, 425.

calcaratus in rabbits, fatal infections, 267.

hamatus n.sp., description, 590.

spp., notes, 590.

Trifidaphis phaseoli, notes, 232.

Trimeromicrus maculatus, notes, 696.

Trimethylamine, isolation from spores of *Tilletia levis*, 165.

Triphenylmethyl derivative of vitamin C, 773.

Trisodium arsenite and arsenious acid, relative toxicity to house fly, 244.

Trissolcus euschisti, notes, 689.

Trout—

food consumption, relation to water temperature, N.Y.Cornell 72.

nutritional requirements, N.Y.Cornell 90.

racas, relation of weight to length, N.Y.Cornell 72.

rainbow, cause of curdled milt in, N.Y.Cornell 72.

Truck crops—

composition, effect of fertilizers and soils, Fla. 178.

fertilizer experiments, Fla. 209.

Florida, grading, packing, and stowing, Fla. 50.

for exportation, P.R. 50.

improvement, Calif. 48.

variety tests, Ga.Coastal Plain 48.

Trucking area of State, Ohio 127.

Trucks, *see* Motor truck.

Trypan blue, effect on agglutinin titer in abortion infected cows, 108.

Trypanosoma—

cruzi infection from intestine of cone-nose bug, 425.

evansi infection, treatment with Bayer 205, 861.

- Trypanosoma*—Continued.
hippicum in Panama, animal susceptibility to, 583.
hippicum, susceptibility of bats to, 592.
hippicum, transmission experiments with vampire bat, 712.
spp., infection of fowls in Uganda, 596.
- Tryptophane, content of glutelins, 165.
- Tsetse fly, bionomics and control, 694.
- Tuba root, Malayan, rotenone content, 75.
- Tubercle bacilli—
bovine, culture method, 271.
human and avian types, recovered from swine, 718.
in eggs, 271.
life cycle phenomena and filtrability, 711.
new medium for isolation, 425.
precipitin tests with Anderson phosphatide fractions, significance, 271.
specific carbohydrate, 487.
types in livestock sanitary control work, 275.
- Tubercle bacillus—
B.C.G., microbic dissociation, 583, 584.
cells, toxicity of iodine for, 425.
- Tuberculin potency, relation to glycerine in veal broth, 105.
- Tuberculosis—
avian, in cattle in Great Britain, 109.
avian, in muscovy ducks, 115.
bovine, serological diagnosis, 710.
bovine, studies, 275.
endocardial and myocardial, case of, 580.
experimental avian, pathology, 720.
experimental, use of iodine and iodine compounds, 425.
experimental, vaccination with heat-killed and formalinized tubercle bacilli, 869.
human, types of tubercle bacilli in, 425.
immunization with B.C.G. vaccine, 272, 584, 588.
in calves, vaccination with B.C.G., 105.
in cattle and B.C.G. culture, Calif. 104.
in domestic animals, pathological anatomy and pathogenesis, 578.
in domestic animals, studies, 578, 579, 580.
in hogs due to avian type of tubercle bacillus, 719.
of udder in cows, 588.
skin, of swine, 580.
studies, Nebr. 578.
- Tularemia—
in birds, experimental, 271.
in grouse, 271.
in muskrats, experimental, 271.
in quail, 271.
- Tulip—
fire, control, 541.
mosaic or breaking, historical sketch, 823.
- Tulips, periodicity in, shifting, 27.
- Tuliptree, nectar secretion, 87.
- Tumors, transmissible, of fowls, 436.
- Tung-oil trees—
culture and fertilizer tests, Fla. 209.
resistance to winter injury, Ga. 209.
variety tests, Ga.Coastal Plain 48.
- Turkey—
eggs, artificial incubation, Idaho 839.
eggs, hatchability, effect of age and holding temperatures, 847; Kans. 249.
eggs, incubating, temperature requirement, Kans. 249.
eggs, loss in weight during incubation, Nebr. 562.
embryos, rate of growth and embryonic development, Kans. 249.
- Turkeys—
affected with enterohepatitis, fertility and hatchability of eggs, 437.
Bronze, blood analyses, 847.
inflammation of sinuses and respiratory disturbances, Calif. 104.
management, Nebr. 562.
pedigree breeding, Calif. 88.
poisoning by eucalyptus wood ashes. Calif. 104.
raising, Ind. 89; Nebr. 847.
raising in confinement, Hawaii 698.
raising in semi-confinement, N.Mex. 705.
raising, studies, Kans. 249.
raising, supplemental value of green feeds and protein mash, Oreg. 412.
raising, treatise, 704.
staphylococcal arthritis in, 115.
- Turnips—
for livestock, culture and harvesting, U.S.D.A. 354.
internal breakdown, Mass. 663.
variety tests, Alaska 36; Oreg. 354.
- Turpentine beetle, red, in Golden Gate Park, control, 560.
- Turpentine beetle, red, method of control, 836.
- Twig girdler, notes, Fla. 231.
- Tylenchorhynchus* spp., notes, 228.
- Tylenchus*—
dipsaci—
effect of vapor heat treatment of bulbs, 687.
in soil, barley as detector crop, 811.
notes, 69.
on onions, N.Y.Cornell 61.
scandens, notes, 526.
spp., notes, 228.
- Typhlocyba*—
comes, see Grape leafhopper.
pomaria, see Apple leafhopper, white.
rosae, see Rose leafhopper.
- Typhoid, avian, see Fowl typhoid.
- Typhus fever virus, experimental transmission, 582.
- Tyrosinase, iron in, 486.

Tyrosine, content of glutelins, 165.

Tyrosine in cocoons, 4.

Tyrosyl-tyrosine, titration constants, 5.

Udders, bacteriology, 855.

Ufens osborni, notes, P.R. 825.

Ultraviolet—

component of sunlight, daily measurement, 620.

irradiation—

effect on dermatitis preventing vitamin, Mo. 152.

of farm stock and foodstuff, development, 879.

of poultry, 256, 287.

light—

effect on vitamin A in butter, Ind. 150.

fluorescence reaction in *Lolium* spp., 345.

transmission through window glass, 845.

use in agricultural production, Idaho 871.

value against mastitis, 108.

radiation—

effect on seed germination and early growth, 506.

effect on seed plants, 782.

for rickets, quantity relation to area of skin exposed, 314.

of sun in Puerto Rico, intensity, 474.

rays and cod-liver oil, effect on growing organism, 703.

rays, effect on intestinal flora of rachitic rats, 473.

rays, effect on soil bacteria, 343.

transmitting glass, solarization, 148.

Undulant fever—

epidemic, 270.

Huddleson slide test v. two tube test, 584.

in the Punjab, 584.

relation to brucelliasis in cattle and swine, 870; Va. 869.

United States Department of Agriculture—

appropriations available, editorial, 321.

Bureau of Plant Quarantine, *see* Bureau of Plant Quarantine.

Office of Experiment Stations, *see* Office of Experiment Stations.

Weather Bureau, *see* Weather Bureau.

Uracil, irradiation, 169.

Urea in plants, movement, 188.

Uredinopsis pteridis, life history, 70.

Urinary calculi in a lamb, 430.

Urine—

acidity, effect of diet, 896.

composition, effect of yeast ingestion, 146.

iodide determination in, 633.

of cattle, acid-base balance, effect of rations, 699.

of livestock, ketones in, 715.

of patients with pituitary tumors, absence of gonad-stimulating hormone, 350.

Urine—Continued.

pregnancy and pituitary substances, specificity in action, 197.

pregnancy, effect on lactating mice, 196.

pregnancy, intravenous and intraperitoneal injections, effect on immature female rabbits, 197.

Urocystis miyabeana n.sp., description, 69.

Uronic acids in food plants, 494.

Ustilago—

kolleri, biological species, 666.

maydis on corn, swellings caused by, 814.

spp., genetics and cytology, Minn. 346.

zeae, bacterium antibiotic to, Minn. 222.

zeae, genetics, Minn. 222.

zeae, resistance of strains of corn to, Iowa 60.

Uterus of cattle, isolated, pharmacological investigations, 710.

Utricularia traps, range of structural and functional variation, 188.

Vaccines, nature and value to animal husbandry, 272.

Valota saccharata, growth and germination, N.Mex. 200.

van Leeuwenhoek, Anthony, and his "little animals", treatise, 545.

Vapo Dust, development in scientific pest control, 685.

Varestrongylus pneumonicus n.g. and n.sp., notes, 431.

Vegetable—

crops, scouting for insect outbreaks, 686.

diseases, 526.

diseases in greenhouse, control, Mass. 663.

diseases, pocket atlas, 663.

diseases, studies, results, U.S.D.A. 652.

gardening, *see* Gardens.

industry of State, seasonal variations, Kans. 288.

pests, new methods of control, U.S.D.A. 652.

proteins, *see* Proteins.

stabilizers in ice cream, Kans. 257.

weevil, control, Calif. 71, 85.

weevil, nomenclature, 836.

Vegetables—

acidity, effect of carbon dioxide, 50.

and nitrates, R.I. 178.

arsenical residues on, Conn.State 209.

breeding studies, results, U.S.D.A. 652.

changes during freezing storage and thawing, Calif. 772.

cooking, conserving food value, flavor, and attractiveness, U.S.D.A. 462.

culture experiments, Alaska 47; Nebr. 520.

current research, types, 891.

fertilizer experiments, Ga. 209; P.R. 798.

formaldehyde dust for, Ohio 61.

Vegetables—Continued.

- green, hemoglobin-regenerating properties, 763.
- harvesting and packing operations, labor requirements, Mass. 737.
- insects affecting, 385.
- local demand for, factors affecting, Mass. 737.
- official standards for grading, Fla. 50.
- oxygen uptake, effect of carbon dioxide, 50.
- preservation, quick freezing v. slow freezing methods, Calif. 143.
- reducing substance and vitamin C in, 8.
- root and leaf, vitamin G in, 155.
- snails injurious to in Japan, 682.
- soil management experiments, Nebr. 521.
- spray residue studies, 210.
- strain and variety tests, Fla. 209.
- studies, Kans. 210.
- testing, Conn.State 157.
- varietal and cultural experiments, Md. 652.
- varieties, Ohio 49; Wis. 798.
- variety and strain tests, Me. 364.
- variety tests, Fla. 209; Ga. 209; Ga.Coastal Plain 48; Mass. 652; N.H. 364; Nebr. 520.
- Velvetbean caterpillar, control, Fla. 232.
- Velvetbeans—
 - fertilizer experiments, Ga.Coastal Plain 37.
 - variety tests, V.I. 512.
- Ventilation—
 - of animal shelters, 124.
 - of dairy barns in Quebec, 600.
- Venturia inaequalis*—
 - ascospore discharge, relation to environment, 377.
 - notes, 820.
- Verticillium* wilt of eggplant, tomato, and potato, Wis. 810.
- Vetch—
 - bird, analyses, Alaska 36.
 - culture experiments, Ga.Coastal Plain 37.
 - cutting with binder or mower, Alaska 36.
 - fertilizer experiments, Fla. 199; Ga. 199.
 - for hay, tests, Alaska 36.
 - variety tests, Ga.Coastal Plain 37; Mass. 643; Oreg. 354.
- Veterinary—*see also* Animal diseases. medicine—
 - guttadiaphot method in, 580.
 - medieval-oriental, contribution to, 578.
- Village and family in India, 302.
- Vine weevil, black, on Japanese yew, 548.
- Violet root disease, notes, 526.
- Violet root rot in Texas, U.S.D.A. and Tex. 528.

- Viosterol—*see also* Ergosterol, irradiated. and phosphate ion, comparison for antirachitic value, 471.
- Virgin Islands Station, report, 621.
- Virginia College, notes, 480.
- Virginia Station, notes, 480, 912.
- Viruses, filtrable, in vitro cultivation, 865.
- Vitamin A—
 - absorption spectrum at low temperatures, 772.
 - and carotene in yellow corn, 898.
 - and carotene, relation, 151, 467.
 - and carotenoids, 150.
 - and growth-promoting action of egg yolk, 466.
 - chemical nature and nutritive functions, 756.
 - deficiency—
 - cause of infections, 151.
 - effect on concentration of blood lipids, 618.
 - effect on nervous system of white rat, Ohio 99.
 - in castrated male rats, 759.
 - in dogs, 759.
 - in rats, cornified vaginal cells as index, 759.
 - infection of accessory sinuses in, 467.
 - lesions of nervous system in, 311.
 - of fowls, histology of eye alterations in, 710.
 - relation to respiratory troubles in tuberculous rats, 901.
 - deficient diet, effect on blood cholesterol in dogs, 468.
 - deficient rations, effect on pigs, 406.
 - determination, vaginal smear method, 630.
 - determinations, improvements in basal ration for, Iowa 148.
 - effect on disease resistance and antibody production, 149.
 - for cows, sorghum silage as source, Tex. 100.
 - highly active, characteristics, 325.
 - in alfalfa exposed to sunshine in curing process, 251.
 - in alfalfa hay cut at different stages, Ind. 98.
 - in apples, white-tissued and yellow-tissued, 758.
 - in butterfat, 418.
 - in canned tomatoes, effect of storage, 148; Iowa 148.
 - in carrots, effect of storage and canning, Mont. 898.
 - in cod-liver oil emulsions, stability, 759.
 - in cod-liver oil, inhibitor of antimony trichloride test for, 773.
 - in cod-liver oils, 630.
 - in corpora lutea from cows, Ohio 99.
 - in cranberries, 143.
 - in ether extract of wheat flours, 168.
 - in fish oils of Philippines, 150.

Vitamin A—Continued.

- in fresh and dried apricots, 757.
- in mango varieties, 307.
- in milk, effect of heating, 466.
- in milk of various breeds, Nebr. 572.
- in Nancy Hall sweetpotatoes, 756.
- in pasture plants, 412; Idaho 898.
- in pimiento peppers, 308.
- in plants as associated with supplied nutrients, Iowa 48.
- in soybean hay, Ind. 98.
- in sweetpotatoes, effect of fertilizers, Iowa 148.
- in thick butter cookies, loss on baking, Wis. 890.
- in varieties of frozen cherries, 465.
- plant pigments as sources, Fla. 303.
- prophylactic acid in helminthiasis, 268.
- requirements of pullets, Tex. 95.
- reserves in livers of native mine laborers, 900.
- review of recent literature, 148.
- studies, Ind. 150.
- technic, 148.
- treatment in infancy, 900.
- value of cod-liver oil, increasing, 466.
- yellow corn meal and alfalfa meal as sources, N.H. 406.

Vitamin, antineuritic, *see* Vitamin B (B₁).

Vitamin B (B₁)—

- and G, differentiation, Mo. 152.
- chemical nature and nutritive functions, 756.
- chemistry, 6, 150, 151.
- coprophagy as source, 469.
- crystalline preparation from yeast and rice bran, 326.
- deficiency—
 - and pyruvic acid, 902.
 - effect on differential leucocyte count during lactation, 617.
 - pH determinations in organs of pigeons, 761.
- deficient ration, 761.
- effect on consumption and use of food, 899.
- effect on lactation and growth, Ark. 760.
- from rice bran and polyneuritis in experimental animals, 326.
- from rice polishings, concentration and purification, 325.
- heat stability, 844.
- highly potent concentrate, preparation, 168.
- in alfalfa and timothy hay cut at various stages, Ohio 90.
- in beef and pork, effect of cooking and canning, 406, 468.
- in body tissues of rats, 469.
- in broccoli, 308.
- in carrots, effect of storage and canning, Mont. 898.
- in cranberries, 143.
- in different milling products, Kans. 308.
- in dry skim milk and whey, 418.

Vitamin B (B₁)—Continued.

- in hay, factors affecting, Ohio 839.
 - in milk, effect of yeast feeding, Ohio 99.
 - in Nancy Hall sweetpotatoes, 756.
 - in organs of white rats, 308.
 - in rice, 761.
 - in rice, effect of parboiling and milling, 469.
 - in swedes, effect of storage, Mont. 899.
 - isolation from rice polishings, 148.
 - preparations, comparative potency, 326.
 - requirements, effect of food consumption, 148.
 - requirements for lactation, effect of fat in diet, 618.
 - role in utilization of fats, 760.
 - sparing action of fat on, 468.
 - stability to heat and alkalinity, Mich. 152.
 - studies, use of chick in, 844.
 - ultraviolet absorption spectrum and chemical structure, 325.
- Vitamin B₂, *see* Vitamin G.
- Vitamin B₃, heat stability, 844.
- Vitamin B₄ from yeast, crystalline hydrochloride of, 902.
- Vitamin B complex—
- chemistry, 150.
 - relation to infection and immunity, 269.
 - relation to renal enlargement, 152.
 - studies, Ohio 152.
- Vitamin C—
- and ascorbic (hexuronic) acid, identity, 11, 169, 774, 902.
 - and glutathione in animal tissues, estimation and distribution, 471.
 - and narcotine, relation, 9, 10, 772.
 - and suprarenal cortex, 904.
 - chemical nature, 631.
 - chemical nature and nutritive functions, 756.
 - chemical reactions of, 170.
 - chemistry and conservation in foods, 902.
 - constitution, 170, 774.
 - disappearance from adrenals during scurvy, 619.
 - distribution in Baldwin and McIntosh apples, 903.
 - in adrenal gland, 903.
 - in Baldwin apples, 902.
 - in canned citrus products, 309.
 - in carrots, effect of storage and canning, Mont. 899.
 - in cranberries, 143, 890.
 - in fresh and dried apricots, 757.
 - in fresh lime juice, 904.
 - in Idaho Russet Burbank potatoes, Idaho 898.
 - in mango varieties, 307.
 - in milk, determination, 309.
 - in milk, effect of rations, Kans. 257.
 - in orange juice, relation to reducing values, 618.

Vitamin C—Continued.

- in strawberries, 891.
- in swedes, effect of storage, Mont. 899.
- in Winesap apples, effect of fertilizers, 470.
- international standard for, 618.
- nature, 8, 9, 10.
- preparation from lemon juice, 774.
- recent work, critical review, 9.
- relation to reducing capacity of plant food material, 7.
- requirements of dogs, 105.
- sources in India, 310.
- stability, relation to copper in canned foods, 153.
- triphenylmethyl derivative, 773.

Vitamin D—

- chemical nature and nutritive functions, 756.
- concentrate from cod-liver oil, use, 154.
- crystalline preparations, 151.
- deficiency—
 - and anemia, 762.
 - effect on concentration of blood lipids, 618.
 - effect on differential leucocyte count during lactation, 617.
 - in calves, effect, Wis. 705.
 - relation to anemia, 624.
- determination, 762.
- determination by growth-promoting property, 631.
- effect on calcium and phosphorus utilization, 406.
- effect on disease resistance and antibody production, 149.
- from salmon oil for pigs, Ohio 90.
- fortified milk, protective value for infants, 153, 154.
- in alfalfa exposed to sunshine in curing process, 252.
- in cacao bean, 310.
- in cranberries, 143.
- in mango varieties, 307.
- in milk, Mich. 574.
- in milk, increasing, N.J. 705; Ohio 99.
- intestinal iron reduction test for and synthesis, Iowa 148.
- line tests, photographic records, 775.
- mode of action, 105.
- review of recent literature, 148.
- supplements, determination of value, 774.
- supplements for laying hens, Wis. 839.
- treatment of acne vulgaris, 762.

Vitamin E—

- in wheat embryo, 898.
- relation to xanthophyll, 467.
- review of literature, 904.

Vitamin F, *see* Vitamin B (B₁).Vitamin G (B₂)—

- and protein intake, 472.
- and vitamin B (B₁), differentiation, Mo. 152.
- deficiency, new symptom complex in, 472.

Vitamin G (B₂)—Continued.

- deficient diets, production in dogs of syndrome similar to sprue by, 470.
- effect on consumption and use of food, 899.
- heat stability, 844.
- in alfalfa and timothy hay cut at various stages, Ohio 90.
- in body tissues of rats, 469.
- in broccoli, 308.
- in cranberries, 143.
- in dry skim milk and whey, 418.
- in hay, factors affecting, Ohio 839.
- in milk, effect of yeast feeding, Ohio 99.
- in potatoes, Idaho 898.
- requirements for laying hens, Wis. 839.
- requirements of chicks, N.Y.Cornell 90; Ohio 90.
- studies, improvement in method, 469.
- studies, use of chick in, 844.

Vitamin—

- requirements of cattle and pigs during growth, 563.
- salts, crystals, microphotographs, 6.
- therapy, intensive, in measles, 151.

Vitamins—

- aid reduction of lost time in industry, 149.
- and hormones, relationship, 465.
- and infections, 757.
- chemistry of, recent advances, 630.
- deficiency—*see also* Avitaminosis.
 - relation to anemia, Ark. 758.
- in alfalfa hay, changes in, Colo. 840.
- in canned foods, 619.
- in Hawaiian foods, 756.
- in health and disease, treatise, 897.
- in plant tissues, availability, 617.
- in Puerto Rican sweetpotatoes, Ga. 308.
- in rations of laying hens, value, Kans. 570.
- in various fruits, Mass. 747.
- physiological functions, 148.
- recent research on, 307.
- role in growth and disease resistance, 464.
- studies, Hawaii 747.
- studies, Bezssonoff reaction, 630.
- supplying to poultry, Calif. 88.
- unscrambling, 756.

Volcanic ash, liverworts as vegetative pioneers on, 336.

Voles, transmission of loupung ill to, 712.

Wages, purchasing power, N.Y.Cornell 127.

Walking, energy cost of, 465.

Walls, rammed earth, protective coverings for, 438.

Walnut—

- case bearer, control, Fla. 231.
- caterpillar, notes, Fla. 231.
- crown rot and blight, notes, Calif. 60.
- crown rot in Victoria, 541.
- husk fly, control, 833.
- husk fly, insecticides for control, Calif. 71.

Walnut—Continued.

- husk fly, seasonal history, effect of host resistance and temperature, 833.
- husk maggot, life history notes, 395.
- yellow, relation to ash constituents, 541.

Walnuts—

- in Wooster Arboretum, list, Ohio 217.
- moldy, relation to picking frequency, Calif. 47.
- mutations in, 28.
- production, dichogamy, important factor in, 807.
- production, increasing by artificial pollination, 807.
- variety and stock tests, Fla. 209.

Washing, colloid chemistry, 324.

Washing machines, current consumption, Ind. 156.

Washington College, notes, 623.

Wasps—

- jungle, of largest island in Gatún Lake, 560.
- seed infesting chalcid, from West Indies, 72.
- wood, biology and technical significance, 234.

Waste treatment, colloidal aspects, 324.

Water—

- absorption by aerial parts of plants, 25.
 - artesian, ground reservoir, drainage of land overlying, Utah 118.
 - control in soils, Fla. 281.
 - examination, standard methods, 330.
 - gardens, treatise, 216.
 - ground, rate and cause of rise in Mesilla Valley, N.Mex. 282.
 - heaters, electric dairy, Ind. 116.
 - heating, electric, for dairies, 598.
 - hemlock poisoning in swine, 277.
 - hyacinth seedlings in Burma, 797.
 - in living organisms, nature, Minn. 318.
 - in phosphate rock, 487.
 - lilies, treatise, 216.
 - movement in permeable earth bodies, 118.
 - of Virginia, chemical character, 117.
 - plan, State, of California, 442.
 - plants and water soils, relation, Mich. 495.
 - potable, preparation with Carbosteril, 117.
 - power on farms, development and utilization, N.C. 437.
 - spring, in rural districts, effect of salamanders, 117.
 - supply, colloid factors in, 323.
 - supply of Hawaii, 116, 282.
 - supply of United States, 1931, 116, 281, 596.
 - surfaces, oil-covered, evaporation from, 722.
- Waterfowl in captivity, habits and management, 256.

Watermelon—

- Fusarium* wilt, resistance to, Fla. 221.
- mosaic, resistance to, Fla. 221.
- wilt resistant varieties of Iowa, testing in Texas, U.S.D.A. and Tex. 536.

Watermelons—

- culture experiments, Ga.Coastal Plain 48.
 - fertilizer experiments, Ga.Coastal Plain 48.
 - grading, packing, and stowing, Fla. 50.
 - improvement, Calif. 48.
 - insects and animal pests, Fla. 231.
 - tests, V.I. 520.
 - variety tests, Ga.Coastal Plain 48.
- Watershed, relation to cultivated land planning, 444.
- Wattle bark industry, development in South Africa, 450.

Wax moth—

- eggs and larvae, experimental destruction, 242.
- life history, distribution, and control, 80.

Weather—see also Meteorological observations and Meteorology.

- and climate station for plants, suggestions for, 775.
- Bureau, report, U.S.D.A. 332.
- Bureau, research work of, 634.
- Bureau service to engineers, improving, 494.
- conditions, effect on anchorage of corn plants, Va. 41.
- forecasting from phases and declination of moon, 13.
- forecasting, long-range, 175.
- of coming winter, forecasting, 13.
- of 1932 in United States, U.S.D.A. 176.
- of world, 13.
- periodicities in, 175.
- relation to sunspots and planets, 175.
- relation to wheat stem rust in Nebraska, 64.

Webworm, beet, notes, Mont. 232.

Webworm, fall, notes, Fla. 231.

Webworms, sod, outbreak of 1931, 548.

Weed killers, composition, Conn.State 234.

Weed plats sprayed with atlacide, spontaneous combustion from, 651.

Weed seed population of arable soil, 650.

Weeds—

- control, Alaska 36; Calif. 37; Idaho 789; Ind. 37; Ohio 38.
 - control by sodium chlorate, 797.
 - control, machinery and fire for, Calif. 116.
 - deep-rooted perennial, arsenical compounds for control, Calif. 520.
 - eradication with zinc sulfate and by burning, Mich. 525.
 - harmful effects and control, 797.
- Weevils, Philippine, in Hawaii, 385.
- Weirs, full depth control, two forms, 871.
- Wells, battery of, computing effective diameter, 437.

West Virginia—

Station, notes, 319, 480.

University, notes, 480.

Wheat—

Albit, resistance to bunt, inheritance, 346.

and barley for pigs, grinding, 405.

and dairy situation, Okla. 288.

and rye hybrids, studies, Ga. 199.

and soybeans, feeding value for swine, 405.

and wheat products, colloid chemistry, 323.

antirachitic properties, 755.

area, tractor and horse power in, S.Dak. 286.

as cattle feed, Kans. 407; Mo. 699.

asynaptic dwarf, meiosis in, 783.

balance, daily, of plants in arid regions, 189.

bran as laxative, 303.

breeding, Ga. 199; Idaho 788; Ind. 37; Iowa 37; Kans. 200; N.Y. Cornell 38; Nebr. 512; Oreg. 354.

breeding for baking quality, Minn. 318.

breeding in Ohio, status, Ohio, 796.

bunt, *see* Wheat smut, stinking.

combined, effect of storing method, Kans. 281.

cost of production in 1930 and 1931, Kans. 287.

crinkle joint, notes, 64.

crop in United States, status, U.S.D.A. 650.

crops, world, 1885-1932, 609.

cultipacking and mulching, Ohio 38.

culture experiments, Ga.Coastal Plain 37; Idaho 788; Kans. 200.

diseases, control methods, 222.

diseases, new or unusual, in Kansas, 64.

diseases, notes, Kans. 221.

domestic allotment plan for, 295.

durum, acre values, Minn. 201.

durum, situation, 609.

dwarfing in, inheritance, 30.

effect of fertilizers and of leaf rust, Ind. 37.

exports of United States, 1920-32, Ohio 600.

exports of United States, price spreads and restraint, 138.

feeding value, Nebr. 562; Ohio 99.

feeding value compared with other grains, 840.

fertilizer experiments, 792; Del. 37; Kans. 200; Nebr. 512; Oreg. 354.

flag smut, studies, 529.

Florence crosses, inheritance of stinking smut resistance, 191.

flour, *see* Flour.

foot and root rot, effect of age of plant, 529.

foot and root rot, studies, 811.

foot rot, relation to grasses in Alberta, 530.

Wheat—Continued.

for fattening calves, Nebr. 562.

foreign government legislation affecting, U.S.D.A. 133.

futures, July and September, at Chicago since 1885, price relations, 453.

germ, dried yeast, and rice bran, comparison for vitamin B content, Hawaii 747.

germination after years of storage, 363.

grain texture and protein in, effect of fertilizers, Ohio 38.

ground, v. ground corn for dairy cows, Kans. 257.

hard grain texture, 46.

harvested in 1931, bread-making quality, 201.

heads, infection by *Gibberella saubinetii*, 667.

hogging down, Ohio 90.

Hope crosses, inheritance of bunt reaction and other characters, 347.

hybrids, unpaired chromosomes in, 785.

joint worm, distribution and damage, Utah 837.

leaf rust infection, effect on yield, 667.

leaf rust, resistance to, Kans. 222.

loose smut, notes, 526.

milling products, vitamin B (B_1) in, Kans. 308.

New Mexico, protein and moisture in, N.Mex. 200.

oil, iodine number as test of rancidity, Ind. 3.

pest, new, in Montana, Mont. 232.

plant, phosphorus and nitrogen compounds in, 637.

plants, absorption of potassium and phosphorus, effect of pH, 363.

policy, new, of Great Britain, 883.

prices, fluctuations, Kans. 287.

producers, large-scale, of Kansas, marketing attitudes, 600.

production in Germany, effect of climate, 178.

productivity, direct effect of fungicides, 668.

proteins, biological values, 896.

quality, Kans. 200.

quality, effect of farm storage, Kans. 597.

region, Columbia Plateau, 737.

resistance to insect injury, Kans. 232.

rotation experiments, U.S.D.A. 789.

rust—*see also* Wheat leaf rust, Wheat stem rust, and Rust.

effect on yield, quality, and composition, Ind. 60.

in South Australia, 1932-33, 668.

penetration, relation to stomatal aperture, Ind. 60.

physiologic forms, hybridization, 63.

resistance of higher internodes of host, 64.

Wheat—Continued.

rust—continued.

spore color and pathogenicity in crosses of physiologic forms, inheritance, 64.

sampling technic, 650.

seed bed preparation, Kans. 200.

seed bed preparation methods and crop residues for, Oreg. 354.

seedling blight, effect of environment, 372.

seedlings, formative effect of day length on, 26.

sheath gall jointworm, distribution and damage, Utah 837.

situation, April to November 1932, 452.

situation, December 1932 to April 1933, 743.

situation, world, 1931-32, 452.

smut—

resistance, 668.

stinking, control, Nebr. 512.

stinking, inheritance of resistance to in Florence crosses, 191.

stinking, notes, 526.

stinking, overwintering in Canada, 811.

stinking, physiologic forms, reaction of varieties and hybrids to, 639.

stinking, resistance to, Calif. 60.

stinking, spores, trimethylamine isolation from, 165.

stinking, susceptibility and resistance of varieties to, 667.

snow scald, notes, Idaho 810.

spring—

acre values, Minn. 201.

and winter, responses to day length and temperature, 650.

early-ripening varieties, breeding in Canada, 320, 796.

rotation and tillage experiments, U.S.D.A. 789.

varieties for North Dakota, N.Dak. 207.

variety tests, Alaska 36; Kans. 200; Me. 353; N.Mex. 200; Nebr. 512; Oreg. 354; U.S.D.A. 789.

stem maggot, notes, Kans. 232.

stem rust—

greenhouse seedling reactions and field reactions, 812.

in Nebraska, prevalence, relation to weather, 64.

infection, relation to yield, 222.

resistance in crosses, 222.

stocks, end-year world, estimation 1922-33, 453.

straw worm, distribution and damage, Utah 837.

straw worm, notes, Kans. 232.

take-all, field studies in Saskatchewan, 222.

testing for protein, Mont. 46.

top-dressing with nitrogen, Ind. 776.

Wheat—Continued.

trade, organization in India, 295.

used as fuel, calorific value, Idaho 871.

varieties, cold resistance in, Kans. 200.

varieties for Columbia River Basin, Oreg. 208.

variety tests, Ga.Coastal Plain 37; Idaho 788; Md. 643.

variety-cultural experiments, Iowa 37. whole, and bran v. liver for hemoglobin regeneration, 145.

winter—

acre values, Minn. 201.

decrease in hardness, factors affecting, 638.

dry-land production, Nebr. 789.

improved sorts, Md. 643.

response to dates of planting and methods of soil preparation, N.Mex. 200.

rotation and tillage experiments, U.S.D.A. 789.

seed bed preparation, Kans. 201.

variety tests, Ind. 789; Kans. 200; Me. 353; N.Mex. 200; Nebr. 512; Oreg. 354; U.S.D.A. 789.

yield and dependability, Okla.Panhandle 790.

yields, Ind. 789.

yields and tree growth in southern Saskatchewan, U.S.D.A. 178.

yields, variation in experimental plats, 198.

Wheatgrass, crested, factors affecting production, Wyo. 791.

Whey, dry, vitamin B and G in, 418.

Whey, feeding value, Calif. 88.

Whipworms, n-butylidene chloride test for, 106.

White ants, *see* Termites.

White grubs—

in sugarcane fields, control, 826.

notes, Wis. 825.

studies, Iowa 71.

White pine—

afforested area, hardwood invasion, 58. and birch forest, soil temperatures and evaporation, 58.

blister rust, control, Conn.State 217.

blister rust infection, determining age, 679.

blister rust sporidia, field inoculations with, 679.

dominance in, early expression, 371.

northern, in southern Appalachians, growth rate, 660.

reproduction, effect of thinning, Vt. 809.

weevil attack on Scotch pine, 245.

Whitefish, dried, vitamin D and proteins in, effect of methods of drying, Me. 410.

Whiteflies, vectors of zinnia leaf curl, 828.

Whitefly, citrus—

and *Dialeurodes kirkaldyi*, distinguishing characters, 690.

food plants, 689.

Willow leaf beetle, imported, notes, 232.

Willows, two Marssonina diseases on, 542.

Wind—

electric plant, Iowa 597.

electric power of Oklahoma, 877.

injury to citrus and persimmons, avoiding, Calif. 47.

injury to forests in Switzerland, 14.

Windbreaks, *see* Trees, windbreak.

Winter fat, growth and germination, N.Mex. 200.

Winter scours of cattle, 714.

Wireworm—

larvae, distribution in tobacco soil, Conn.State 550.

prothetely in, 396.

Wireworms—

and summer-fallow methods in Saskatchewan, 695.

attacking roots of staple crops, Kans. 232.

chloropicrin as soil insecticide for, 84. notes, Me. 385; Ohio 72.

poison baits for, field experiments, 84.

relation to pitting of potatoes, N.Y. Cornell 72.

studies, 547.

toxicity of carbon disulfide to, effect of temperature, 835.

Wisconsin—

Station, fiftieth anniversary, editorial, 161.

Station, notes, 623.

Station, report, 909.

University, notes, 623, 912.

Women—

during reproductive cycle, nitrogen utilization, 751.

inheritance of hemophilia, 508.

pregnant, attempted induction of labor by, 353.

Wood—*see also* Lumber and Timber.

and wood formation, colloid chemistry, 323.

brashness in, causes, U.S.D.A. 219.

Canadian, mechanical properties, 662.

decay and growth of Hymenomyces, effect of temperature, 680.

decay, effect of insecticides and fungicides, Ark. 875.

floors, conditions for laying over concrete subfloors, 120.

in Japan, sap stains of, 680.

preservatives, water-soluble, leaching tests, 727.

tick, sexual transmission of Rocky Mountain fever virus, 400.

transportation in chutes, 120.

Woodland—

farm, exclusion of livestock from, U.S.D.A. 372.

farm, natural regeneration following livestock exclusion, Ind. 371.

products, marketing, Ind. 57.

Woodpeckers, friends of our forests, 381.

Woody—

cuttings, regeneration processes in, effect of leaves and buds, 188.

plants, storage of seeds, N.Y.Cornell 57.

Wool—

effects of plane of nutrition, Calif. 88. fibers, crimp or waviness in, studies, 315.

fibers, electrical resistance, 315.

held on ranch, loss in weight, 565.

industry, Australian, report, 610.

industry in South Africa, 450.

inheritance in Hampshire-Rambouillet crossbreds, Wyo. 786

preparation for market, U.S.D.A. 156.

quantitative estimation, 476.

quality, improvement, Nev. 93.

research, need of new units of measurement, 406.

situation, Okla. 288.

survey, production and trade in British Empire and foreign countries, 294.

yolk in, Calif. 88.

Workers, substandard, effect of supplementing diet with cod-liver oil and milk, 150.

World War debts, economic consequences, Okla. 288.

Worms—

in hogs, poultry, and sheep, Mont. 425. parasitic, longevity, 544.

Wounds, infected, surgical maggots in treatment, 83.

X organism associated with brain lesions of sheep, 858.

Xanthine derivatives, function in plant metabolism, 188.

Xanthoma, giant celled, in subcutis of horse, 710.

Xanthophyll—

relation to vitamin E, 467.

vitamin A value, Wis. 839.

Xenia and metaxenia in apples, 29, 522.

Xerophthalmia, experimental, in dogs, 759.

X-ray researches on colloids, 323.

X-ray treatment, effect on inbred strain of guinea pigs, 353.

X-rays—

control of seed-borne diseases by, 665.

effect on bean weevil, 397.

effect on plants, 638; N.Y.Cornell 25.

genetic mutations produced by, 28.

high-voltage, effect on seeds, 638.

Xylan, fermentation products, Iowa 3.

Xylococcus macrocarpae, honeydew from, 555.

Xylotrechus quadripes, chalcid parasite in Indochina, 561.

Yak-Galloway hybrids, carcass tests, Alaska 88.

Yams, breeding, P.R. 39.

Yautias—

fertilizer experiments, P.R. 39.

variety tests, P.R. 790.

Yeast—

- cells, lethal effect of alternating current on, Calif. 6.
- dried, wheat germ, and rice bran, comparison for vitamin B content, Hawaii 747.
- effect on chick rations, Wis. 839.
- extract medium for examination of milk, Mich. 102, 103.
- feeding, effect on vitamin B and vitamin G in milk, Ohio 99.
- feeding value for fattening pigs on rape pasture, Iowa 89.
- ingestion, effect on composition of urine and feces, 146.
- irradiated, effect on cows, 259.
- Yellow fever vectors, geographical distribution, 393.

Zatropis incertus, notes, 696.

Zebu infection with piroplasms, 718.

Zebu, intersexuality in, 35.

Zinc—

in food and biological material, bibliography, 752.

in milk, 415.

sulfate, use against weeds, Mich. 525.

Zinnia—

kreepoek, studies, 673.

leaf curl, white fly as vector, 828.

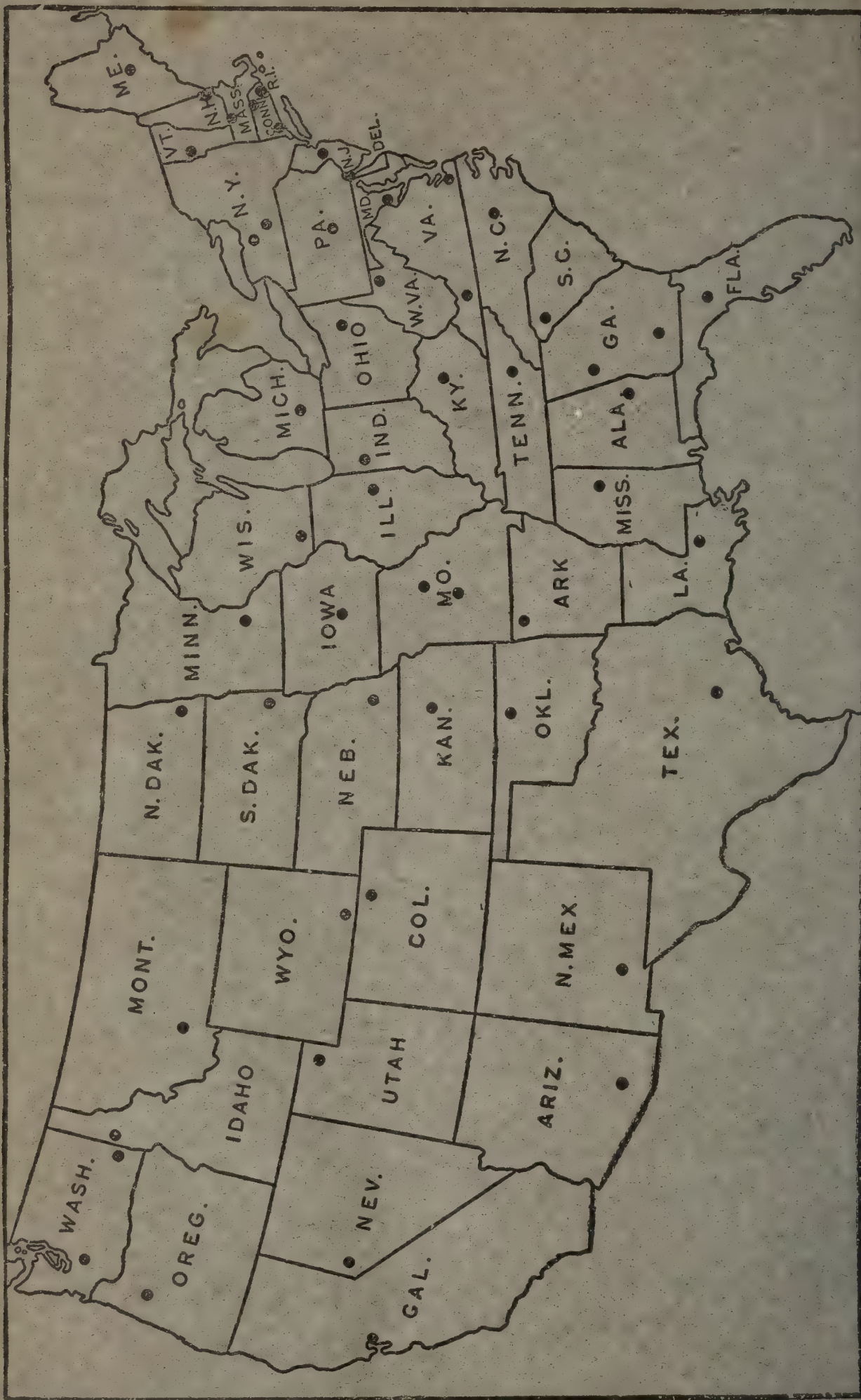
new angular leaf spot disease, 70.

Zooecidia of plants in South and Central America, 382.

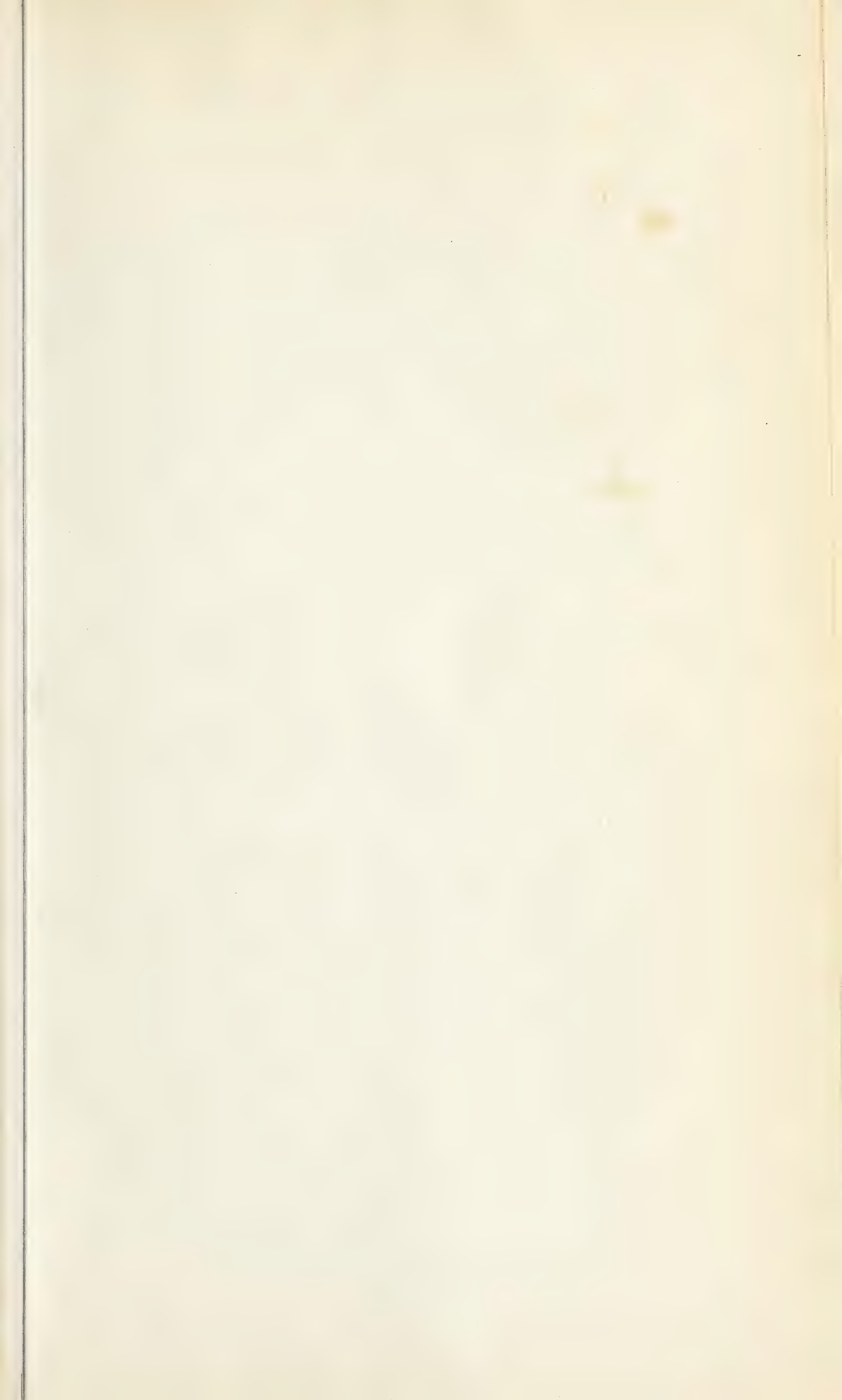
Zoology, International Congress, proceedings, 543.

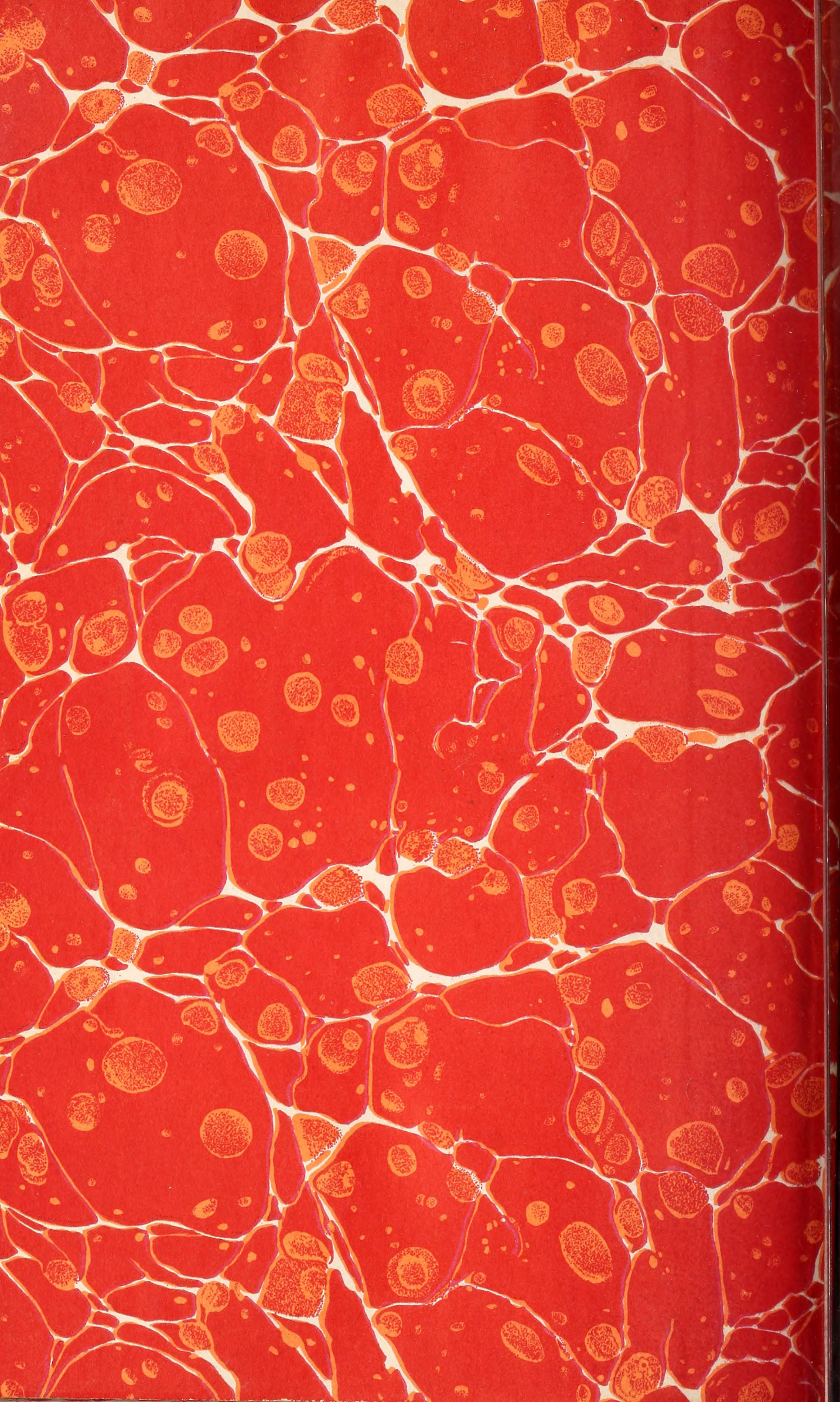
Zootermopsis angusticollis, association with fungi, 553.





THE AGRICULTURAL EXPERIMENT STATIONS OF THE UNITED STATES





GPO 8-243

AUG 5

1
EX6R
V.69, J

U. S. DEPARTMENT OF AGRICULTURE
LIBRARY

NOTICE TO BORROWERS

Please return all books promptly after finishing your use of them, in order that they may be available for reference by other persons who need to use them.

Please do not lend to others the books and periodicals charged to you. Return them to the Library to be charged to the persons who wish them.

The mutilation, destruction, or theft of Library property is punishable by law. (20 Stat. 171, June 15, 1878.)

Lib. 9



GPO

8-7888

